Course Outcome 1

Experiment 1 Date:

Basic Java Programs

Aim:

Write the following programs
i) Print the prime numbers up to a limit

Program

```
import java.io.*;
class PrimeInLimit
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("Enter Limit");
int n=Integer.parseInt(x.readLine());
System.out.println("Prime numbers up to "+n+":");
for(int num = 2; num <= n; num++)
{
int flag=0;
for (int i = 2; i<num/2; i++)
{
if (num % i == 0)
{
flag=1;
break;
}
}
if(flag==0)
{
System.out.println(num);
}
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java PrimeInLimit
Enter Limit
15
Prime numbers up to 15:
2
3
4
5
7
11
13
```

ii) Print the 3-digit Armstrong numbers between two intervals.

Program

```
import java.io.*;
class ArmstrongInLimit
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("Enter Limit 1");
int num1=Integer.parseInt(x.readLine());
System.out.println("Enter Limit 2");
int num2=Integer.parseInt(x.readLine());
System.out.println("Armstrong Numbers:");
for (int i = num1; i<num2; i++)
{
int n=0;
int temp=i;
while (temp != 0)
{
temp=temp/10;
n=n+1;
}
int sum=0;
temp=i;
while (temp != 0)
{
```

```
int digit=temp%10;
sum=sum+(int)Math.pow(digit,n);
temp=temp/10;
}
if (sum==i)
{
System.out.println(i);
}
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ArmstrongInLimit
Enter Limit 1:
100
Enter Limit 2:
500
Armstrong Numbers:
153
370
371
407
```

Experiment 2 Date:

One-Dimensional Array

Aim:

Write a Java program to search an element in an array

Program

```
import java.io.*;
class ElementCheck
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("enter limit of array");
int n=Integer.parseInt(x.readLine());
int a[]=new int[n];
System.out.println("enter elements");
for(int i=0;i<n;i++)
{
a[i]=Integer.parseInt(x.readLine());
}
System.out.println("elements");
for(int i=0;i<n;i++)
{
System.out.print(a[i]+" ");
}
System.out.println();
int c=1,flag=0;
System.out.println("enter element to check");
int y=Integer.parseInt(x.readLine());
for(int i=0;i<n;i++)
{
if(a[i]==y)
{
flag=1;
break;
}
c=c+1;
}
if(flag==1)
{
System.out.println("element found at position "+c);
}
else
{
System.out.println("element not found");
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ElementCheck
enter limit of array
4
enter elements
8
4
6
2
elements
8 4 6 2
enter element to check
6
element found at position 3

mits@mits-Veriton-M200-H510:~/gokul java$ java ElementCheck
enter limit of array
4
enter elements
8
4
6
2
elements
8 4 6 2
enter element to check
10
element not found
```

Experiment 3 Date:

Two-Dimensional Array

Aim:

Write a program to read a matrix from the console and check whether it is symmetric or not.

Program

```
import java.io.*;
class SymmetricMatrix
{
public static void main(String args[]) throws IOException
{
int flag=0;
DataInputStream x=new DataInputStream(System.in);
System.out.println("Enter order of matrix");
int n=Integer.parseInt(x.readLine());
int a[][]=new int[n][n];
System.out.println("Enter elements of Matrix");
for(int i=0;i<n;i++)
{
for(int j=0;j<n;j++)
{
a[i][j]=Integer.parseInt(x.readLine());
}
}
System.out.println("Matrix elements");
for(int i=0;i<n;i++)
{
for(int j=0;j<n;j++)
{
System.out.print(a[i][j]+" ");
}
System.out.println();
}
for(int i=0;i<n;i++)
{
for(int j=0;j<n;j++)
{
if(a[i][j]!=a[j][i])
{
flag=1;
break;
}
}
}
if(flag==0)
{
System.out.println("Matrix is Symmetric");
}
else
{
System.out.println("Matrix is not Symmetric");
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java SymmetricMatrix
Enter order of matrix
3
Enter elements of Matrix
1
0
1
0
1
0
1
0
1
Matrix elements
1 0 1
0 1 0
1 0 1
Matrix is Symmetric

mits@mits-Veriton-M200-H510:~/gokul java$ java SymmetricMatrix
Enter order of matrix
3
```

```
Enter elements of Matrix
1
0
4
5
1
6
1
0
5
Matrix elements
1 0 4
5 1 6
1 0 5
Matrix is not Symmetric
```

Experiment 4 Date:

String Handling Methods- 1

Aim:

Perform the following operations on strings
i. Find the length of the string
ii. Character at second and fourth position
iii. Find the sub string using start index only
iv. Find the sub string using start index and end index
v. Compare two strings lexicographically.
vi. Compare two strings lexicographically, ignoring case differences.
vii. Concatenate a given string to the end of another string.
viii. Replace a specified character with another character.
ix. Check whether a given string starts with another string.
x. Convert all characters in a string to lowercase
xii. Convert all characters in a string to uppercase.

Program

```
import java.io.*;
class StringOperations
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("1.Length of string");
System.out.println("Enter a string");
String s=x.readLine();
System.out.println("string is: "+s);
System.out.println("length of string is: "+s.length());
System.out.println();

System.out.println("2.Character At Position");
System.out.println("Character at second position: "+s.charAt(1));
System.out.println("Character at fourth position: "+s.charAt(3));
System.out.println();

System.out.println("3.Substring Using Start Index");
System.out.println("Enter start index");
int st=Integer.parseInt(x.readLine());
```

```
System.out.println("Substring from start index: "+s.substring(st));
System.out.println();

System.out.println("4.Substring Using Start and End Index");
System.out.println("Enter start index");
int st1=Integer.parseInt(x.readLine());
System.out.println("Enter end index");
int ed=Integer.parseInt(x.readLine());
System.out.println("Substring from start to end index: "+s.substring(st1,ed));
System.out.println();

System.out.println("5.Compare Strings");
System.out.println("Enter a new string1");
String s8=x.readLine();
System.out.println("Enter a new string2");
String s9=x.readLine();
if(s8.equals(s9))
{
System.out.println("String equal");
}
else
{
System.out.println("String not equal");
}
System.out.println();

System.out.println("6.Compare Strings(Ignore Case)");
System.out.println("Enter a new string1");
String s10=x.readLine();
System.out.println("Enter a new string2");
String s11=x.readLine();
if(s10.equalsIgnoreCase(s11))
{
System.out.println("String equal");
}
else
{
System.out.println("String not equal");
}
System.out.println();
System.out.println("7.Concatenate Strings");
System.out.println("Enter a new string1");
String s1=x.readLine();
System.out.println("Enter a new string2");
String s2=x.readLine();
System.out.println("After Concatenate: "+s1.concat(s2));
System.out.println();

System.out.println("8.Character Replace");
System.out.println("Enter a new string");
String s3=x.readLine();
System.out.println("Enter a character to replace");
char ch1=(x.readLine().charAt(0));
System.out.println("Enter new character");
char ch2=(x.readLine().charAt(0));
System.out.println("After Replace: "+s3.replace(ch1,ch2));
System.out.println();

System.out.println("9.Start With a String");
System.out.println("Enter a new string");
String s4=x.readLine();
System.out.println("Enter start string");
String s5=x.readLine();
if(s4.startsWith(s5))
{
System.out.println("String start with "+s5);
}
else
{
System.out.println("String not start with "+s5);
}
System.out.println();

System.out.println("10.Uppercase");
System.out.println("Enter a new string");
String s6=x.readLine();
System.out.println("Uppercase: "+s6.toUpperCase());
System.out.println();

System.out.println("11.Lowercase");
System.out.println("Enter a new string");
String s7=x.readLine();
System.out.println("Lowercase: "+s7.toLowerCase());
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java StringOperations
1.Length of string
Enter a string
gokulrajc
string is:
length of string is: 9

2.Character At Position
Character at second position: o
Character at fourth position: u

3.Substring Using Start Index
Enter start index
4
Substring from start index:
ulrajc

4.Substring Using Start and End Index
Enter start index
2
Enter end index
6
Substring from start to end index:
Okul

5.Compare Strings
Enter a new string1
abcd
Enter a new string2
ABCD
String not equal

6.Compare Strings(Ignore Case)
```

```
Enter a new string1
abcd
Enter a new string2
ABCD
String equal

7.Concatenate Strings
Enter a new string1
gokul
Enter a new string2
raj
After Concatenate:
gokulraj

8.Character Replace
Enter a new string
malayalam
Enter a character to replace
m
Enter new character
x
After Replace:
xalayalax

9.Start With a String
Enter a new string
hi welcome
Enter start string
hi
String start with hi

10.Uppercase
Enter a new string
abcd
Uppercase: ABCD

11.Lowercase
Enter a new string
ABCD
Lowercase: abcd
```

Experiment 5 Date:

String Handling Methods- 2

Aim:

Write a java program to

i. Check whether a given string is palindrome or not.

Program

```
import java.io.*;
class StringPallindrome
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("Enter a string");
String s1=x.readLine();
String s2="";
System.out.println("String:"+s1);
int l = s1.length();
for(int i=l-1;i>=0;i--)
{
s2=s2+s1.charAt(i);
}
System.out.println("Reversed String:"+s2);
if(s1.equals(s2))
{
System.out.println("pallindrome");
}
else
{
System.out.println("not pallindrome");
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java StringPallindrome
Enter a string
malayalam
```

```
String:malayalam
Reversed String:malayalam
pallindrome

mits@mits-Veriton-M200-H510:~/gokul java$ java StringPallindrome
Enter a string
welcome
String:welcome
Reversed String:emoclew
not pallindrome
```

ii. Sorting a given list of names in ascending order

Program

```
import java.io.*;
class NameSort
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("Enter limit");
int n=Integer.parseInt(x.readLine());
String str[]=new String[n];
String temp;
System.out.println("Enter names");
for(int i=0;i<n;i++)
{
str[i]=x.readLine();
}
for (int i=0;i<n;i++)
{
for (int j=0;j<n;j++)
{
if(str[i].compareTo(str[j]) > 0)
{
temp=str[i];
str[i]=str[j];
str[j]=temp;
}
}
}
System.out.println();
System.out.println("Names");
for(int i=0;i<n;i++)
{
System.out.println(str[i]);
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java NameSort
Enter limit
5
Enter names
thomas
abhijith
allen
gokul
adwaith

Names
abhijith
adwaith
allen
gokul
thomas
```

Experiment 6 Date:

StringBuffer Class Methods

Aim:

Write a program in java for string handling which performs the following
i. Check the capacity of the StringBuffer object.
ii. Reverse the content of this string and convert the resultant string in upper case
iii. Read another string and append it to the resultant string of above.

Program

```
import java.io.*;
class StringBufferExample
{
public static void main(String args[]) throws IOException
{
DataInputStream d = new DataInputStream(System.in);
System.out.println("Enter a string:");
String str = (d.readLine());
StringBuffer s = new StringBuffer(str);
System.out.println("Capacity is "+s.capacity());
s.reverse();
String s2 = s.toString().toUpperCase();
StringBuffer ss = new StringBuffer(s2);
System.out.println("After resversing and converting to uppercase: "+ss);
System.out.println("Enter a string to append:");
String s1 = (d.readLine());
System.out.println("New String: "+ss.append(s1));
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java StringBufferExample
Enter a string:
gokul
Capacity is 21
After resversing and converting to uppercase: LUKOG
Enter a string to append:
raj
New String: LUKOGraj
```

Course Outcome 2

Experiment 7 **Date:**

Initialize instance variables using class and method

Aim:

Program to demonstrate use of command line arguments to initialize values to member variables in a class and to display them.
Hint:- Create a class containing Rlno, stud_name, engmark, mathsmark, totalmark. While executing the program we have to pass arguments through command line. These values are obtained in an array which is passed as argument to main function, here it is args[ ]. The marks are converted correspondingly and then passed to constructor where values are stored to class variables. Find the total marks and later displayed using display function.

Program

```
class Student
{
int rollno;
String name;
int eng;
int math;
int total;
Student(int r,String s,int e,int m)
{
rollno=r;
name=s;
eng=e;
math=m;
}
void totalmark()
{
total=eng+math;
}
void display()
{
System.out.println("roll no: "+rollno);
System.out.println("name: "+name);
System.out.println("english mark: "+eng);
System.out.println("maths mark: "+math);
System.out.println("total mark: "+total);
}
}
class TotalMark
{
public static void main(String args[])
{
int r=Integer.parseInt(args[0]);
String s=args[1];
int e=Integer.parseInt(args[2]);
int m=Integer.parseInt(args[3]);
Student s1=new Student(r,s,e,m);
s1.totalmark();
s1.display();
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java TotalMark 29 gokul 60 70
roll no: 29
name: gokul
english mark: 60
maths mark: 70
total mark: 130
```

Experiment 8 Date:

Initialize instance variables inside the class using constructor

Aim:

Program to demonstrate use of constructors to initialize values to member variables in a class and to display them.
Hint:- empno , empname and salary are the class members of the class employee1. From the main function we are passing the values directly to a constructor, the constructor initializes the values to member variables. The display function is used to display the stored values of the member variables.

Program

```
import java.io.*;
class Employee
{
int empno;
String empname;
int salary;
Employee(int r,String n,int s)
{
empno=r;
empname=n;
salary=s;
}
void display()
{
System.out.println("employee details");
System.out.println("employee no: "+empno);
System.out.println("employee name: "+empname);
System.out.println("salary: "+salary);
}
}
class EmployeeDetails
{
public static void main(String args[]) throws IOException
{
DataInputStream x=new DataInputStream(System.in);
System.out.println("enter employee no");
int r=Integer.parseInt(x.readLine());
System.out.println("enter employee name");
String n=x.readLine();
System.out.println("enter employee salary");
int s=Integer.parseInt(x.readLine());
Employee e1=new Employee(r,n,s);
e1.display();
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java EmployeeDetails
enter employee no
101
enter employee name
Gokul raj c
enter employee salary
25000
employee deatils
employee no: 101
employee name: Gokul raj c
salary: 25000
```

Experiment 9 Date:

Matrix Operations

Aim:

Read 2 matrices from the console and perform matrix addition and multiplication using class and object.

Program

```
import java.io.*;
class Matrix
{
int row;
int cols;
int arr[][];
int arr1[][];
int arr2[][];
Matrix(int r,int c)
{
row=r;
cols=c;
arr=new int[r][c];
}

void readMatrix(DataInputStream x) throws IOException
{
for(int i=0;i<row;i++)
{
for(int j=0;j<cols;j++)
{
arr[i][j]=Integer.parseInt(x.readLine());
}
}
}

void displayMatrix()
{
for(int i=0;i<row;i++)
{
for(int j=0;j<cols;j++)
```

```
{
System.out.print(arr[i][j]+" ");
}
System.out.println();
}
}

void addMatrix(Matrix other)
{
if((row != other.row) || (cols != other.cols))
{
System.out.println("addition not possible");
}
else
{
arr1=new int[row][cols];
for(int i=0;i<row;i++)
{
for(int j=0;j<cols;j++)
{
arr1[i][j]=arr[i][j]+other.arr[i][j];
System.out.print(arr1[i][j] +" ");
}
System.out.println();
}
}
}

void mulMatrix(Matrix other)
{
if(other.row != other.cols)
{
System.out.println("multiplication not possible");
}
else
{
arr2=new int[row][other.cols];
for(int i=0;i<row;i++)
{
for(int j=0;j<other.cols;j++)
{
for(int k=0;k<cols;k++)
{
arr2[i][j]=arr2[i][j]+(arr[i][k]*other.arr[k][j]);
}
System.out.print(arr2[i][j] +" ");
}
System.out.println();
}
}
}

}

class MatrixAddMul
{
public static void main(String args[]) throws IOException
{
DataInputStream x = new DataInputStream(System.in);
System.out.println("enter row of matrix1:");
int r1=Integer.parseInt(x.readLine());
System.out.println("enter column of matrix1:");
int c1=Integer.parseInt(x.readLine());
Matrix m1 = new Matrix(r1,c1);
System.out.println("enter values of matrix1:");
m1.readMatrix(x);

System.out.println("enter row of matrix2:");
int r2=Integer.parseInt(x.readLine());
System.out.println("enter column of matrix2:");
int c2=Integer.parseInt(x.readLine());
Matrix m2 = new Matrix(r2,c2);
System.out.println("enter values of matrix1:");
m2.readMatrix(x);

System.out.println("matrix1:");
m1.displayMatrix();
System.out.println("matrix2:");
m2.displayMatrix();
System.out.println("matrix addition:");
```

```
m1.addMatrix(m2);
System.out.println("matrix multiplication:");
m1.mulMatrix(m2);
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java MatrixAddMul
enter row of matrix1:
2
enter column of matrix1:
2
enter values of matrix1:
1
2
3
4
enter row of matrix2:
2
enter column of matrix2:
2
enter values of matrix1:
5
6
7
8
matrix1:
1 2
3 4
matrix2:
5 6
7 8
matrix addition:
6 8
10 12
matrix multiplication:
19 22
43 50
```

Experiment 10 Date:

Complex Number Addition

Aim:

Write a Java program to add to complex numbers using object as argument

Program

```
import java.io.*;
class Complex
{
int real;
int imag;
Complex(int r,int i)
{
real = r;
imag = i;
}
void addNumber(Complex other)
{
int real1;
int imag1;
real1=real+other.real;
imag1=imag+other.imag;
System.out.println(real1 + " + " + imag1 + "i");
}

void display()
{
System.out.println(real + " + " + imag + "i");
}
}

public class ComplexAddition
{
public static void main(String args[]) throws IOException
{
int a1,a2,b1,b2;
DataInputStream x=new DataInputStream(System.in);
System.out.println("Complex number 1");
System.out.println("Enter complex parts:");
a1= Integer.parseInt(x.readLine());
System.out.println("Enter imaginary parts:");
b1= Integer.parseInt(x.readLine());
Complex c1=new Complex(a1,b1);
System.out.println("Complex number 2");
System.out.println("Enter complex parts:");
a2= Integer.parseInt(x.readLine());
System.out.println("Enter imaginary parts:");
b2= Integer.parseInt(x.readLine());
Complex c2=new Complex(a2,b2);

System.out.println("Complex number 1");
c1.display();
System.out.println("Complex number 2");
c2.display();
System.out.println("Complex number addition");
c1.addNumber(c2);
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ComplexAddition
Complex number 1
Enter complex parts:
2
Enter imaginary parts:
3
Complex number 2
Enter complex parts:
4
Enter imaginary parts:
5
Complex number 1
2 + 3i
Complex number 2
4 + 5i
Complex number addition
6 + 8i
```

Experiment 11 Date:

Class and Objects

Aim:

Define a class ‘product’ with data members pcode, pname and price. Create 3 objects of the class and find the product having the lowest price.

Program

```
class Product
{
int price;
String pcode, pname;
Product(String code, String name, int pri)
{
pcode = code;
pname = name;
price = pri;
}
void display()
{
System.out.println("Code: " +pcode);
System.out.println("Name: " +pname);
System.out.println("Price: " +price);
}
}

class ProductDetails
{
public static void main(String args[])
{
Product p1 = new Product("p1", "Mobile", 13000);
Product p2 = new Product("p2", "Watch", 6500);
Product p3 = new Product("p3", "TV", 16000);
System.out.println("Product with the lowest price");
if (p1.price < p2.price && p1.price < p3.price)
{
p1.display();
}
else if (p2.price < p3.price)
{
p2.display();
}
else
{
p3.display();
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ProductDetails
Product with the lowest price
Code: p2
Name: Watch
Price: 6500
```

Experiment 12 Date:

Inner class and Static nested class

Aim:

Create CPU with attribute price. Create inner class Processor with attributes no. of cores, manufacturer and static nested class RAM with attributes memory and manufacturer. Create an object of CPU class and print information of Processor and RAM.

Program

```
import java.util.*;
class CPU
{
int price;
CPU(int price)
{
this.price = price;
}
void display()
{
System.out.println("CPU Info:");
System.out.println("CPU Price:" +price+ " Rs");
}

class Processor
{
int cores;
String manufacturer;
Processor(int cores, String manufacturer)
{
this.cores = cores;
this.manufacturer = manufacturer;
}
void displayProcessorInfo()
{
System.out.println("Processor Info:");
System.out.println("Cores: " + cores);
System.out.println("Manufacturer: " + manufacturer);
}
}
```

```
static class RAM
{
int memory;
String manufacturer;
RAM(int memory, String manufacturer)
{
this.memory = memory;
this.manufacturer = manufacturer;
}
void displayRAMInfo()
{
System.out.println("RAM Info:");
System.out.println("Memory: " + memory + " GB");
System.out.println("Manufacturer: " + manufacturer);
}
}
}

class CpuDetails
{
public static void main(String[] args)
{
Scanner sc=new Scanner(System.in);
System.out.print("Enter Processor Price");
int price=sc.nextInt();
CPU c1=new CPU(price);

System.out.print("Enter Number of Cores");
int cor=sc.nextInt();
sc.nextLine();
System.out.print("Enter Processor Manufacturer");
String manf=sc.nextLine();
CPU.Processor p1 = c1.new Processor(cor, manf);

System.out.print("Enter Memory");
int mem = sc.nextInt();
sc.nextLine();
System.out.print("Enter RAM Manufacturer");
String manf1 = sc.nextLine();
CPU.RAM r1 = new CPU.RAM(mem, manf1);
c1.display();
p1.displayProcessorInfo();
r1.displayRAMInfo();
}
}
```

Output

```
its@mits-Veriton-M200-H510:~/gokul java$ java CpuDetails
Enter Processor Price
45000
Enter Number of Cores
8
Enter Processor Manufacturer
Intel
Enter Memory
16
Enter RAM Manufacturer
Kingston
CPU Info:
CPU Price: 45000 RS
Processor Info:
Cores: 8
Manufacturer: Intel
RAM Info:
Memory: 16 GB
Manufacturer: Kingston
```

Experiment 13 Date:

Array of objects

Aim:

Program to create a class for Employee having attributes eNo, eName, eSalary. Read ‘n’ employee information and Search for an employee given eNo, using the concept of array of Objects.

Program

```
import java.util.*;
class Employee
{
int eNo;
String eName;
double eSalary;
Employee(int no, String name,double salary)
{
eNo = no;
eName = name;
eSalary = salary;
}
void display() {
System.out.println("Employee Number: " + eNo);
System.out.println("Employee Name: " + eName);
System.out.println("Employee Salary: " + eSalary);
}
}
class EmployeeSearch
{
public static void main(String[] args)
{
Scanner sc = new Scanner(System.in);
System.out.print("Enter number of employees");
int n = sc.nextInt();
sc.nextLine();
Employee e1[] = new Employee[n];
for (int i = 0; i < n; i++)
{
System.out.print("Enter Employee Number");
int no=sc.nextInt();
sc.nextLine();
System.out.print("Enter Employee Name");
String name = sc.nextLine();
System.out.print("Enter Employee Salary");
double salary = sc.nextDouble();
e1[i] = new Employee(no, name, salary);
}
System.out.print("Enter Employee Number to Search");
int sNo = sc.nextInt();
int flag=0;

for (int k = 0; k < n; k++)
{
if (e1[k] != null && e1[k].eNo == sNo)
{
flag=1;
System.out.println("Employee Found");
e1[k].display();
break;
}
}
if (flag==0)
{
System.out.println("Employee not found");
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java EmployeeSearch
Enter number of employees
3
Enter Employee Number
101
Enter Employee Name
gokul
Enter Employee Salary
50000
Enter Employee Number
```

```
102
Enter Employee Name
abhijith
Enter Employee Salary
56000
Enter Employee Number
103
Enter Employee Name
adwaith
Enter Employee Salary
60000
Enter Employee Number to Search
101
Employee Found
Employee Number: 101
Employee Name: gokul
Employee Salary: 50000
```

Course Outcome 3

Experiment 14 **Date:**

Method Overloading

Aim:

Write a java program to calculate the area of different shapes namely circle, rectangle and triangle using the concept of method overloading.

Program

```
import java.util.*;
import java.math.*;
class Area{
void findArea(int r){
double area1=3.14*r*r;
System.out.println("Area of circle:"+area1);
}
void findArea(int l,int b)
{
int area2=l*b;
System.out.println("Area of Rectangle:"+area2);
}
void findArea(int x,int y,int z)
{
float s=(float)(x+y+z)/2;
float area=s*(s-x)*(s-y)*(s-z);
double area3=Math.sqrt(area);
System.out.println(s);
System.out.println("Area of Triangle:"+area3);
}
}
class AreaCalculation
{
public static void main(String args[])
{
Scanner sc=new Scanner(System.in);
Area a1=new Area();
System.out.println("enter radius of circle");
int rd=sc.nextInt();
sc.nextLine();
a1.findArea(rd);
System.out.println("enter length of rectangle");
int lh=sc.nextInt();
sc.nextLine();
System.out.println("enter breadth of rectangle");
int bh=sc.nextInt();
sc.nextLine();
a1.findArea(lh,bh);
System.out.println("enter side1 of triangle");
int s1=sc.nextInt();
sc.nextLine();
System.out.println("enter side2 of triangle");
int s2=sc.nextInt();
sc.nextLine();
System.out.println("enter side3 of triangle");
int s3=sc.nextInt();
sc.nextLine();
a1.findArea(s1,s2,s3);
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java AreaCalculation
enter radius of circle
10
Area of circle:314.0
enter length of rectangle
12
enter breadth of rectangle
14
Area of Rectangle:168
enter side1 of triangle
7
enter side2 of triangle
8
enter side3 of triangle
9
Area of Triangle:26.832815729997478
```

Experiment 15 Date:

Single Inheritance and Array of Objects

Aim:

Create a class ‘Employee’ with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class ‘Teacher’ that inherit the properties of class employee and contain its own data members department, Subjects taught and constructors to initialize these data members and also include display function to display all the data members. Use array of objects to display details of N teachers.

Program

```
import java.util.*;
class Employee
{
int empid;
String name;
int salary;
String address;
Employee(int id,String nm,int s,String ad)
{
empid=id;
name=nm;
salary=s;
address=ad;
}
}

class Teacher extends Employee
{
String dept;
String sub;
Teacher(int id,String nm,int s,String ad,String dp,String sb)
{
super(id,nm,s,ad);
dept=dp;
sub=sb;
}
```

```
void displayDetails()
{
System.out.println("Employee Id:"+empid);
System.out.println("Employee Name:"+name);
System.out.println("Employee Salary:"+salary);
System.out.println("Employee Address:"+address);
System.out.println("Teacher Department:"+dept);
System.out.println("Teacehr Subject:"+sub);
System.out.println();
}
}

class EmployeeTeacherDetails
{
public static void main(String args[])
{
Scanner sc=new Scanner(System.in);
System.out.println("enter no of values");
int n=sc.nextInt();
sc.nextLine();
Teacher t1[]=new Teacher[n];
for(int i=0;i<n;i++)
{
System.out.println("enter employee id");
int eid=sc.nextInt();
sc.nextLine();
System.out.println("enter employee name");
String ename=sc.nextLine();
System.out.println("enter employee salary");
int esal=sc.nextInt();
sc.nextLine();
System.out.println("enter employee address");
String eadd=sc.nextLine();
System.out.println("enter teacher department");
String edep=sc.nextLine();
System.out.println("enter teacher subject");
String esub=sc.nextLine();
t1[i]=new Teacher(eid,ename,esal,eadd,edep,esub);
}
System.out.println();
System.out.println("Employee Details");
for(int i=0;i<n;i++)
{
t1[i].displayDetails();
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java EmployeeTeacherDetails
enter no of values
2
enter employee id
101
enter employee name
gokul
enter employee salary
45000
enter employee address
ernakulam
enter teacher department
bca
enter teacher subject
java
enter employee id
102
enter employee name
abhijith
enter employee salary
50000
enter employee address
alappuzha
enter teacher department
mca
enter teacher subject
python

Employee Details
Employee Id:101
Employee Name:gokul
Employee Salary:45000
Employee Address:ernakulam
Teacher Department:bca
Teacehr Subject:java

Employee Id:102
Employee Name:abhijith
Employee Salary:50000
Employee Address:alappuzha
Teacher Department:mca
Teacehr Subject:python
```

Experiment 16 Date:

Multilevel Inheritance and Array of Objects

Aim:

Create a class ‘Person’ with data members Name, Gender, Address, Age and a constructor to initialize the data members and another class ‘Employee’ that inherits the properties of class Person and also contains its own data members like Empid, Company_name, Qualification, Salary and its own constructor. Create another class ‘Teacher’ that inherits the properties of class Employee and contains its own data members like Subject, Department, Teacherid and also contain constructors and methods to display the data members. Use array of objects to display details of N teachers.

Program

```
import java.util.*;
class Person
{
String name;
String gender;
String address;
int age;
Person(String nm,String gn,String ad,int ag)
{
name=nm;
gender=gn;
address=ad;
age=ag;
}
}
class Employee extends Person
{
int empid;
String cname;
String qualfy;
int salary;
Employee(String nm,String gn,String ad,int ag,int eid,String cnm,String qf,int sf)
{
```

```
super(nm,gn,ad,ag);
empid=eid;
cname=cnm;
qualfy=qf;
salary=sf;
}
}
class Teacher extends Employee
{
int teachid;
String subject;
String dept;
Teacher(String nm,String gn,String ad,int ag,int eid,String cnm,String qf,int sf,int
tid,String sub,String dep)
{
super(nm,gn,ad,ag,eid,cnm,qf,sf);
teachid=tid;
subject=sub;
dept=dep;
}
void displayDetails()
{
System.out.println("Person Name:"+name);
System.out.println("Person gender:"+gender);
System.out.println("Person Address:"+address);
System.out.println("Person Age:"+age);
System.out.println("Employee Id:"+empid);
System.out.println("Employee Company Name:"+cname);
System.out.println("Employee Qualification:"+qualfy);
System.out.println("Employee Salary:"+salary);
System.out.println("Teacher Id:"+teachid);
System.out.println("Teacher Subject:"+subject);
System.out.println("Teacher Department:"+dept);
}
}

class PersonEmployeeTeacherDetails
{
public static void main(String args[])
{
```

```
Scanner sc=new Scanner(System.in);
System.out.println("enter no of values");
int n=sc.nextInt();
sc.nextLine();
Teacher t1[]=new Teacher[n];
for(int i=0;i<n;i++)
{
System.out.println("enter person name");
String pname=sc.nextLine();
System.out.println("enter person gender");
String pgen=sc.nextLine();
System.out.println("enter person address");
String padd=sc.nextLine();
System.out.println("enter person age");
int pae=sc.nextInt();
sc.nextLine();
System.out.println("enter employee id");
int ed=sc.nextInt();
sc.nextLine();
System.out.println("enter employee company name");
String ecname=sc.nextLine();
System.out.println("enter employee qualification");
String eqlf=sc.nextLine();
System.out.println("enter employee salary");
int esal=sc.nextInt();
sc.nextLine();
System.out.println("enter teacher id");
int td=sc.nextInt();
sc.nextLine();
System.out.println("enter teacher subject");
String tsub=sc.nextLine();
System.out.println("enter teacher department");
String tdep=sc.nextLine();
t1[i]=new Teacher(pname,pgen,padd,pae,ed,ecname,eqlf,esal,td,tsub,tdep);
}
System.out.println();
System.out.println("Details");
for(int i=0;i<n;i++)
{
t1[i].displayDetails();
System.out.println();
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java PersonEmployeeTeacherDetails
enter no of values
2
enter person name
gokul
enter person gender
male
enter person address
ernakulam
enter person age
22
enter employee id
101
enter employee company name
ibm
enter employee qualification
mca
enter employee salary
45000
enter teacher id
201
enter teacher subject
java
enter teacher department
mca
enter person name
abhijith
enter person gender
male
enter person address
alappuzha
enter person age
23
```

```
enter employee id
102
enter employee company name
tcs
enter employee qualification
mca
enter employee salary
50000
enter teacher id
202
enter teacher subject
python
enter teacher department
mca

Details
Person Name:gokul
Person gender:male
Person Address:ernakulam
Person Age:22
Employee Id:101
Employee Company Name:ibm
Employee Qualification:mca
Employee Salary:45000
Teacher Id:201
Teacher Subject:java
Teacher Department:mca

Person Name:abhijith
Person gender:male
Person Address:alappuzha
Person Age:23
Employee Id:102
Employee Company Name:tcs
Employee Qualification:mca
Employee Salary:50000
Teacher Id:202
Teacher Subject:python
Teacher Department:mca
```

Experiment 17 Date:

Interface 1- Find area and perimeter of objects

Aim:

Create an interface having prototypes of functions area() and perimeter(). Create two classes Circle and Rectangle which implements the above interface. Create a menu driven program to find area and perimeter of objects.

Program

```
import java.util.*;
interface Shape
{
double area();
double perimeter();
}

class Circle implements Shape
{
private double radius;
Circle(double radius)
{
this.radius = radius;
}

public double area()
{
return Math.PI * radius * radius;
}
public double perimeter()
{
return 2 * 3.12 * radius;
}
}

class Rectangle implements Shape
{
private double length, width;
Rectangle(double length, double width)
```

```
{
this.length = length;
this.width = width;
}
public double area()
{
return length * width;
}
public double perimeter()
{
return 2 * (length + width);
}
}

class AreaPerimeter
{
public static void main(String[] args)
{
Scanner sc = new Scanner(System.in);
int ch;
do
{
System.out.println("Menu:\n1.Circle\n2.Rectangle\n3.Exit");
System.out.print("Enter your choice: ");
ch=sc.nextInt();
switch(ch)
{
case 1:
System.out.print("Enter radius of circle: ");
double r = sc.nextDouble();
Circle circle = new Circle(r);
System.out.printf("Area of Circle: %.2f\n", circle.area());
System.out.printf("Perimeter of Circle: %.2f\n", circle.perimeter());
break;
case 2:
System.out.print("Enter length of rectangle: ");
double length = sc.nextDouble();
System.out.print("Enter width of rectangle: ");
double width = sc.nextDouble();
Rectangle rectangle = new Rectangle(length, width);
System.out.printf("Area of Rectangle: %.2f\n", rectangle.area());
System.out.printf("Perimeter of Rectangle: %.2f\n", rectangle.perimeter());
break;
case 3:
System.out.println("User exit");
break;
default:
System.out.println("Invalid choice! Try again.");
}
}
while(ch != 3);
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java AreaPerimeter
Menu:
1.Circle
2.Rectangle
3.Exit
Enter your choice: 1
Enter radius of circle: 10
Area of Circle: 314.16
Perimeter of Circle: 62.40
Menu:
1.Circle
2.Rectangle
3.Exit
Enter your choice: 2
Enter length of rectangle: 4
Enter width of rectangle: 8
Area of Rectangle: 32.00
Perimeter of Rectangle: 24.00
Menu:
1.Circle
2.Rectangle
3.Exit
Enter your choice: 3
User exit
```

Experiment 18 Date:

Interface 2- Prepare bill with the given format

Aim:

Prepare bill with the given format using calculate method from interface.

Order No.:

Date :

Product Id	Name	Quantity	unit price	Total
101	A	2	25	50
102	B	1	100	100

Net. Amount 150

Program

```
import java.util.*;
interface Bill
{
void calculate_total();
}
class BillCalculate implements Bill
{
int product_id,quantity;
float unit_price,total_price;
String product_name;
static float net_total=0;
BillCalculate(int pid,String pname,int qty,float price)
{
product_id = pid;
product_name = pname;
quantity = qty;
unit_price = price;
calculate_total();
}
public void calculate_total()
{
```

```
total_price = quantity * unit_price;
calculate_net_total();
}
void calculate_net_total()
{
net_total+=total_price;
}
void display()
{
System.out.println(product_id+"\t\t"+product_name+"\t\t"+quantity+"\t\t"+unit_price+"
\t\t"+total_price);
System.out.println("--------------------------------------------------------------------------");
}
static void display_net_total(){
System.out.println("\t\t\tNet Amount\t"+net_total);
}
}
class ProductBill
{
public static void main(String args[])
{
Scanner sc =new Scanner(System.in);
int pid,qty;
String pname;
float price;
System.out.println("Product list\n----------");
System.out.println("Product id\tProduct name\tPrice\n----------------------");
System.out.println("101\t\tA\t\t20");
System.out.println("102\t\tB\t\t40");
System.out.println("Enter the number of products needed : ");
int n = sc.nextInt();
sc.nextLine();
BillCalculate bc[] = new BillCalculate[n];
for(int i=0;i<n;i++)
{
System.out.println("Enter product id");
pid = sc.nextInt();
sc.nextLine();
System.out.println("Enter product name");
pname = sc.nextLine();
System.out.println("Enter no of quantity");
qty = sc.nextInt();
sc.nextLine();
System.out.println("Enter unit price");
price = sc.nextFloat();
sc.nextLine();
bc[i] = new BillCalculate(pid,pname,qty,price);
}
System.out.println("Product id\tProduct name\tQuantity\tUnit Price\tTotal");
System.out.println("----------------------------------------------------------------------");
for(BillCalculate b:bc)
{
b.display();
}
BillCalculate.display_net_total();
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ProductBill
Product list
----------
Product id      Product name    Price
---------------------
101             A               20
102             B               40
Enter the number of products needed :
2
Enter product id
101
Enter product name
A
Enter no of quantity
4
Enter unit price
20
Enter product id
102
Enter product name
```

```
B
Enter no of quantity
7
Enter unit price
40
Product id    Product name   Quantity     Unit Price    Total
------------------------------------------------------------------------
102          A             4            20.0          80.0
------------------------------------------------------------------------
101          B             7            40.0          280.0
------------------------------------------------------------------------
                  Net Amount     360.0
```

Experiment 19 Date:

Package 1- Find the area of different shapes

Aim:

Create a Graphics package that has classes for shapes Rectangle, Triangle, Square and Circle. Test the package by finding the area of these figures.

Hint:- Create 3 java files for calculate the area 3 different shapes in the directory Shapes inside the directory where the java program is stored. Then import all the class files inside the package Shapes to our original program.

Equation for area of a circle= A=πr^2 .

Area of a triangle = √(s(s-a)(S-b)(S-c))

Area of a rectangle= l*b

Program

Folder:shape

Circle.java

```
package shape;
public class Circle
{
public double findArea(int r)
{
return 3.14*r*r;
}
}
```

Square.java

```
package shape;
public class Square
{
public int findArea(int a)
{
return a*a;
}
}
```

Rectangle.java

```
package shape;
public class Rectangle
{
public int findArea(int l,int b)
{
return l*b;
}
}
```

Triangle.java

```
package shape;
public class Triangle
{
public double findArea(int a,int b,int c)
{
float s=(a+b+c)/2;
double area=s*(s-a)*(s-b)*(s-c);
return Math.sqrt(area);
}
}
```

Main

```
import java.util.*;
import shape.Circle;
import shape.Rectangle;
import shape.Square;
import shape.Triangle;

class ShapeAreas
{
public static void main(String args[])
{
Scanner sc=new Scanner(System.in);
Square s=new Square();
Circle c=new Circle();
Rectangle r=new Rectangle();
Triangle t=new Triangle();
System.out.println("enter side of square");
int a=sc.nextInt();
sc.nextLine();
System.out.println("area of square: "+s.findArea(a));
System.out.println("enter length of rectangle");
int l=sc.nextInt();
sc.nextLine();
System.out.println("enter breadth of rectangle");
int b=sc.nextInt();
sc.nextLine();
System.out.println("area of rectangle: "+r.findArea(l,b));
System.out.println("enter radius of circle");
int rd=sc.nextInt();
sc.nextLine();
System.out.println("area of circle: "+c.findArea(rd));
System.out.println("enter side1 of triangle");
int s1=sc.nextInt();
sc.nextLine();
System.out.println("enter side2 of triangle");
int s2=sc.nextInt();
sc.nextLine();
System.out.println("enter side3 of triangle");
int s3=sc.nextInt();
sc.nextLine();
System.out.println("area of triangle: "+t.findArea(s1,s2,s3));
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ShapeAreas
enter side of square
4
area of square: 16
enter length of rectangle
5
enter breadth of rectangle
10
area of rectangle: 50
enter radius of circle
```

```
10
area of circle: 314.0
enter side1 of triangle
4
enter side2 of triangle
10
enter side3 of triangle
8
area of triangle: 15.198684153570664
```

Experiment 20 Date:

Package 2- Perform 4 arithmetic operations

Aim:

Create an Arithmetic package that has classes for the 4 basic arithmetic operations. Test the package by implementing all operations on two given numbers.

Program

Folder:arithmetic

Add.java

```
package arithmetic;
public class Add
{
public double add(double a, double b)
{
return a + b;
}
}
```

Subtract.java

```
package arithmetic;
public class Subtract
{
public double subtract(double a, double b)
{
return a - b;
}
}
```

Multiply.java

```
package arithmetic;
public class Multiply
{
public double multiply(double a, double b)
{
return a * b;
}
}
```

Divide.java

```
package arithmetic;
public class Divide
{
public double divide(double a, double b)
{
if (b == 0)
{
throw new ArithmeticException("Cannot divide by zero.");
}
return a / b;
}
}
```

Main

```
import arithmetic.Add;
import arithmetic.Divide;
import arithmetic.Multiply;
import arithmetic.Subtract;
import java.util.*;

class ArithmeticOperations
{
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
System.out.println("Enter number 1");
double num1 = sc.nextDouble();
System.out.println("Enter number 1");
double num2 = sc.nextDouble();
Add a1 = new Add();
Subtract s1 = new Subtract();
Multiply m1 = new Multiply();
Divide d1 = new Divide();
System.out.println("Addition: " + a1.add(num1, num2));
System.out.println("Subtraction: " + s1.subtract(num1, num2));
System.out.println("Multiplication: " + m1.multiply(num1, num2));
try
{
System.out.println("Division: " + d1.divide(num1, num2));
}
catch (ArithmeticException e)
{
System.out.println("Error: " + e.getMessage());
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ArithmeticOperations
Enter number 1
12
Enter number 1
4
Addition: 16.0
Subtraction: 8.0
Multiplication: 48.0
Division: 3.0
```

Experiment 21 Date:

User Defined Exception 1

Aim:

Write a user defined exception class to authenticate the user name and password.

Program

```
import java.util.*;
class UserExcptn
{
static class AuthException extends Exception
{
public AuthException(String message)
{
super(message);
}
}
public static void main(String args[])
{
String correctUsername = "admin";
String correctPassword = "admin123";
Scanner sc = new Scanner(System.in);
System.out.println("Enter username");
String username = sc.nextLine();
System.out.println("Enter password");
String password = sc.nextLine();
try
{
if (!username.equals(correctUsername) || !password.equals(correctPassword))
{
throw new AuthException("invalid username or password.");
}
System.out.println("login success");
}
catch (AuthException e)
{
System.out.println(e.getMessage());
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java UserExcptn
Enter username
gokul
Enter password
123
invalid username or password.
mits@mits-Veriton-M200-H510:~/gokul java$ java UserExcptn
Enter username
admin
Enter password
admin123
login success
```

Experiment 22 Date:

User Defined Exception 2

Aim:

Find the average of N positive integers, raising a user defined exception for each negative input

Program

```
import java.util.*;
class AvgExcptn
{
static class NegativeNumberException extends Exception
{
public NegativeNumberException(String message)
{
super(message);
}
}
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
int n;
double sum = 0;
int count = 0;
System.out.println("enter limit");
n = sc.nextInt();
System.out.println("Enter numbers");
for (int i = 1; i <= n; i++)
{
int num = sc.nextInt();
try
{
if (num < 0)
{
throw new NegativeNumberException("negative number entered: " + num);
}
sum += num;
count++;
}
catch (NegativeNumberException e)
{
System.out.println("Error: " + e.getMessage());
}
}
if (count > 0)
{
System.out.println("Average=" + (sum / count));
}
else
{
System.out.println("invalid number");
}
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java AvgExcptn
enter limit
5
Enter numbers
4
5
7
8
9
Average=6.6
mits@mits-Veriton-M200-H510:~/gokul java$ java AvgExcptn
enter limit
4
Enter numbers
2
4
-4
Error: negative number entered: -4
5
Average=3.6666666666666665
```

Experiment 23 Date:

Exception Handling

Aim:

Program to find the sum of command line arguments and count the invalid integers entered through command line.

Program

```
class ArgExcptn
{
public static void main(String args[])
{
int sum = 0;
int count = 0;
for (String arg : args)
{
try
{
int num = Integer.parseInt(arg);
sum=sum+num;
}
catch (NumberFormatException e)
{
count++;
}
}
System.out.println("Sum of valid=" + sum);
System.out.println("No of invalid=" + count);
}
}
```

Output

```
mits@mits-Veriton-M200-H510:~/gokul java$ java ArgExcptn 4 5 a
Sum of valid=9
No of invalid=1
```

Course Outcome 5

Experiment 24 Date:

Drawing Different Shapes

Aim:

Create the following shapes.

i) cone

ii) cylinder

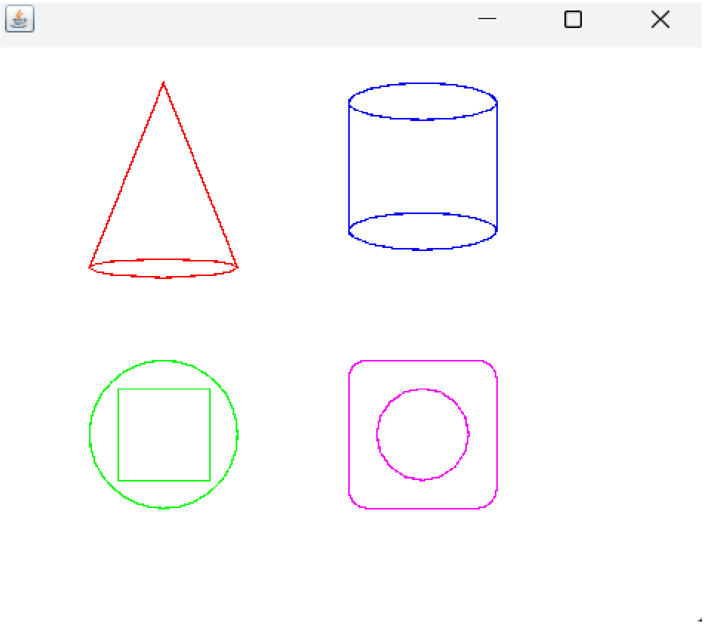
iii) square inside the oval

iv) circle inside rounded square

Program

```
import java.awt.*;
import javax.swing.*;
class AllShapes extends JFrame
{
AllShapes()
{
setSize(400, 350);
setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
setVisible(true);
}
public void paint(Graphics g)
{
g.setColor(Color.RED);
g.drawLine(60, 150, 100, 50);
g.drawLine(140, 150, 100, 50);
g.drawOval(60, 145, 80, 10);
g.setColor(Color.BLUE);
g.drawOval(200, 50, 80, 20);
g.drawLine(200, 60, 200, 130);
g.drawLine(280, 60, 280, 130);
g.drawOval(200, 120, 80, 20);
g.setColor(Color.GREEN);
g.drawOval(60, 200, 80, 80);
g.drawRect(75, 215, 50, 50);
g.setColor(Color.MAGENTA);
g.drawRoundRect(200, 200, 80, 80, 20, 20);
g.drawOval(215, 215, 50, 50);
}
}
class Shapes{
public static void main(String args[])
{
new AllShapes();
}
}
```

Output



Experiment 25 Date:

Event Handling 1- Find the maximum of 3 numbers

Aim:

Program to find maximum of three numbers using AWT. Create three labels, 3 text boxes for entering 3 numbers and one button named Maximum. When the user clicks on the button find the maximum number from these text boxes and display the result in a new text box.

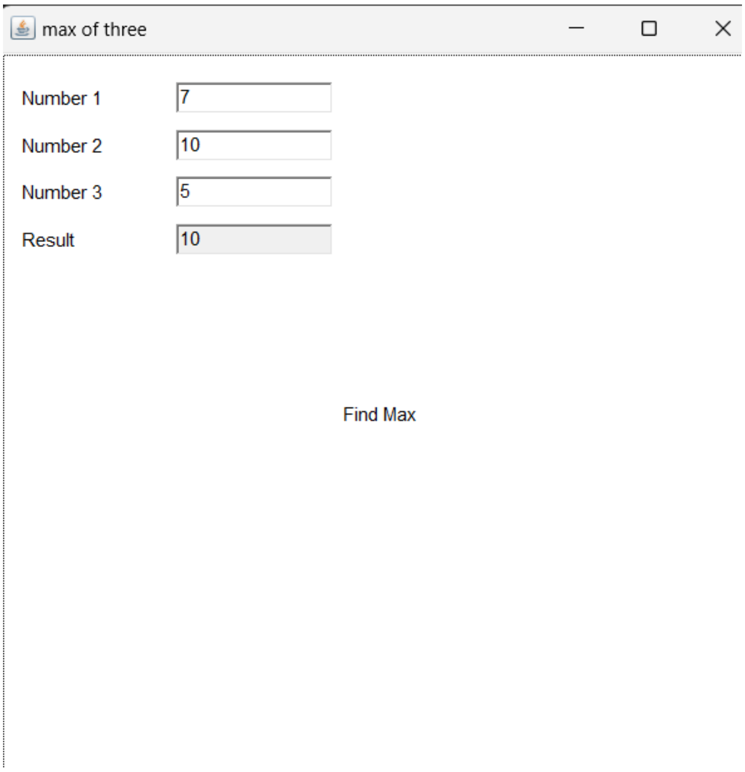
Program

```
import java.awt.*;
import java.awt.event.*;
class FindMax implements ActionListener
{
Label lb1,lb2,lb3,lb4;
TextField txt1, txt2, txt3, result;
Button btn1;
FindMax()
{
Frame f=new Frame("max of three");
f.setSize(500, 500);
f.setVisible(true);
lb1 = new Label("Number 1");
lb2 = new Label("Number 2");
lb3 = new Label("Number 3");
lb4 = new Label("Result");
txt1 = new TextField(10);
txt2 = new TextField(10);
txt3 = new TextField(10);
result = new TextField(10);
result.setEditable(false);  // Optional: Prevent user editing
btn1 = new Button("Find Max");
lb1.setBounds(20, 50, 80, 20);
lb2.setBounds(20, 80, 80, 20);
lb3.setBounds(20, 110, 80, 20);
lb4.setBounds(20, 140, 80, 20);
txt1.setBounds(120, 50, 100, 20);
txt2.setBounds(120, 80, 100, 20);
```

```
txt3.setBounds(120, 110, 100, 20);
result.setBounds(120, 140, 100, 20);
btn1.setBounds(130,130,50,30);
f.add(lb1);
f.add(txt1);
f.add(lb2);
f.add(txt2);
f.add(lb3);
f.add(txt3);
f.add(lb4);
f.add(result);
f.add(btn1);
btn1.addActionListener(this);
}
public void actionPerformed(ActionEvent e)
{
int a = Integer.parseInt(txt1.getText());
int b = Integer.parseInt(txt2.getText());
int c = Integer.parseInt(txt3.getText());
if(a>b && a>c)
{
int max=a;
result.setText(String.valueOf(max));
}
else if(b>c)
{
int max=b;
result.setText(String.valueOf(max));
}
else
{
int max=c;
result.setText(String.valueOf(max));
}
}
}
class MaxThree
{
public static void main(String args[])
{
```

```
new FindMax();
}
}
```

Output



Number 1 7

Number 2 10

Number 3 5

Result 10

Experiment 26 Date:

Event Handling 2- Draw the face

Aim:

Find the percentage of marks obtained by a student in 5 subjects. Display a happy face if he secures above 50% or a sad face if otherwise.

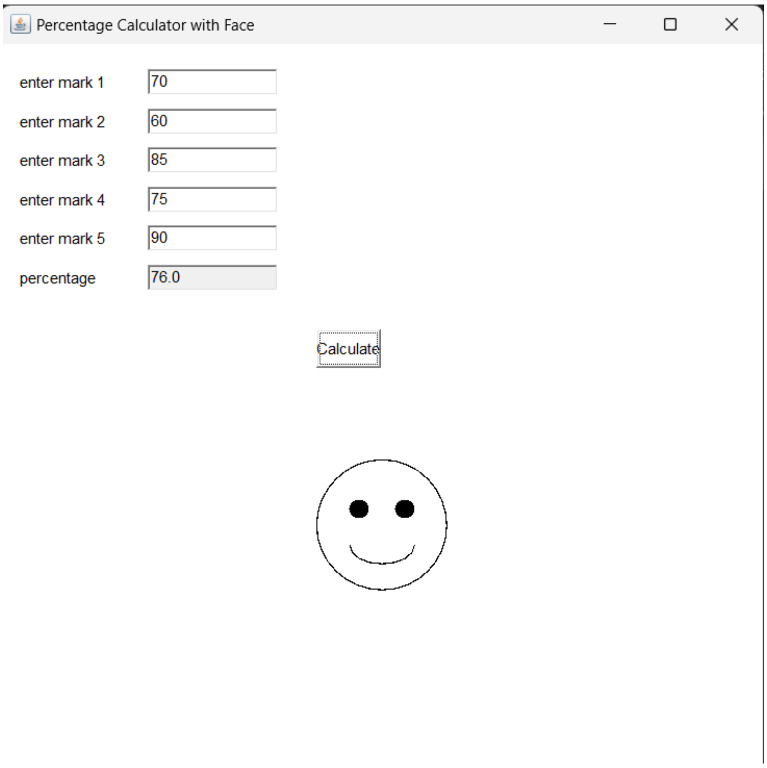
Program

```
import java.awt.*;
import java.awt.event.*;
class FindPercentage extends Frame implements ActionListener
{
TextField t1,t2,t3,t4,t5,t6;
Button b1;
Label l1,l2,l3,l4,l5,l6;
double percentage = -1;
FindPercentage()
{
setTitle("Percentage Calculator with Face");
setSize(600, 600);
setVisible(true);
setLayout(null);
l1=new Label("enter mark 1");
l2=new Label("enter mark 2");
l3=new Label("enter mark 3");
l4=new Label("enter mark 4");
l5=new Label("enter mark 5");
l6=new Label("percentage");
t1 = new TextField(10);
t2 = new TextField(10);
t3 = new TextField(10);
t4 = new TextField(10);
t5 = new TextField(10);
t6 = new TextField(10);
t6.setEditable(false);
b1 = new Button("Calculate");
l1.setBounds(20,50,80,20);
l2.setBounds(20,80,80,20);
```

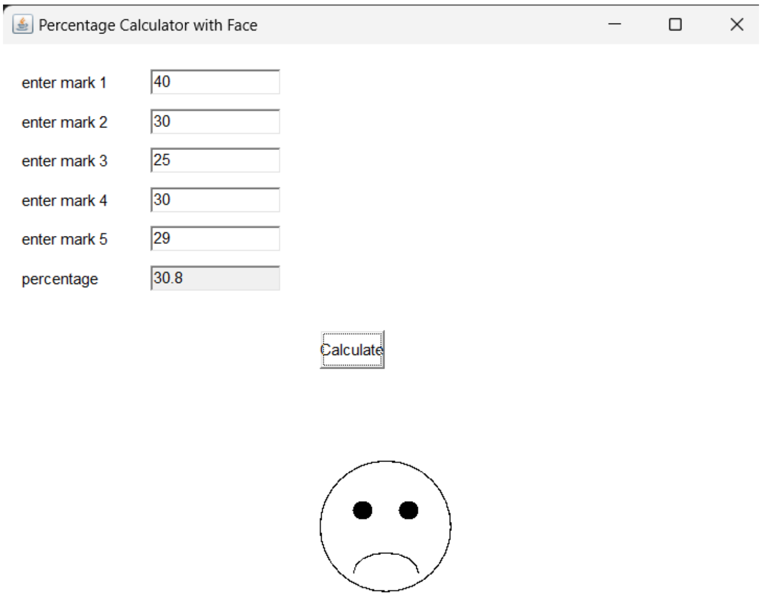
```
l3.setBounds(20,110,80,20);
l4.setBounds(20,140,80,20);
l5.setBounds(20,170,80,20);
l6.setBounds(20,200,80,20);
t1.setBounds(120,50,100,20);
t2.setBounds(120,80,100,20);
t3.setBounds(120,110,100,20);
t4.setBounds(120,140,100,20);
t5.setBounds(120,170,100,20);
t6.setBounds(120,200,100,20);
b1.setBounds(250,250,50,30);
add(l1);
add(l2);
add(l3);
add(l4);
add(l5);
add(l6);
add(t1);
add(t2);
add(t3);
add(t4);
add(t5);
add(t6);
add(b1);
b1.addActionListener(this);
}
public void paint(Graphics g)
{
super.paint(g);
if (percentage == -1) return;
int x = 250, y = 350, size = 100;
g.drawOval(x, y, size, size);
g.fillOval(x + 25, y + 30, 15, 15);
g.fillOval(x + 60, y + 30, 15, 15);
if (percentage > 50)
{
g.drawArc(x + 25, y + 50, 50, 30, 180, 180);
}
else
{
```

```
g.drawArc(x + 25, y + 70, 50, 30, 0, 180);
}
}
public void actionPerformed(ActionEvent ae)
{
int a,b,c,d,e,total;
a = Integer.parseInt(t1.getText());
b = Integer.parseInt(t2.getText());
c = Integer.parseInt(t3.getText());
d = Integer.parseInt(t4.getText());
e = Integer.parseInt(t5.getText());
total=a+b+c+d+e;
percentage = total / 5.0;
t6.setText(String.valueOf(percentage));
repaint();
}
}
class FaceFind
{
public static void main(String args[])
{
new FindPercentage();
}
}
```

Output



```
enter mark 1    70
enter mark 2    60
enter mark 3    85
enter mark 4    75
enter mark 5    90
percentage      76.0
```



```
enter mark 1    40
enter mark 2    30
enter mark 3    25
enter mark 4    30
enter mark 5    29
percentage      30.8
```

Experiment 27 Date:

Event Handling 3- Draw the house and change the color

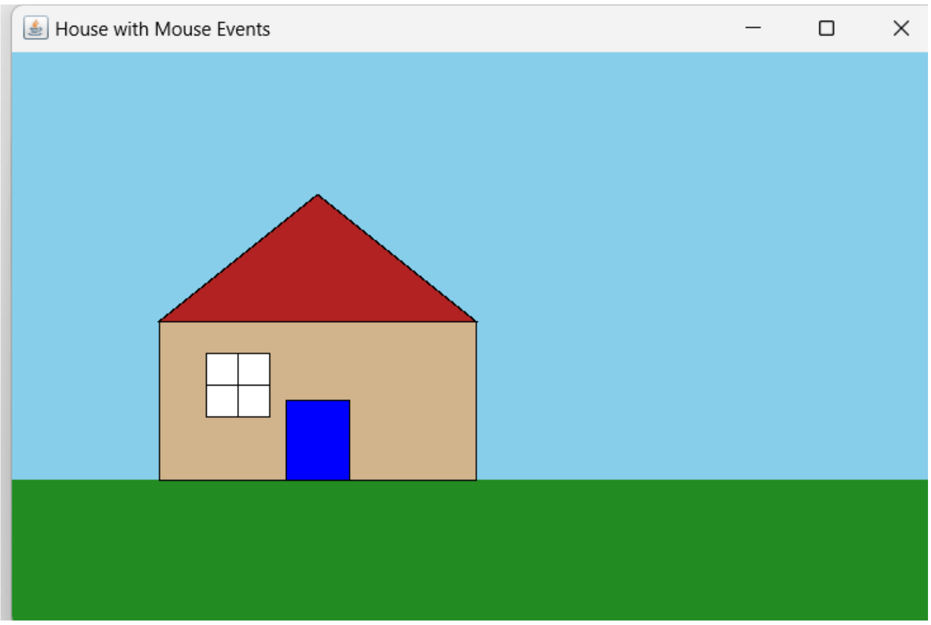
Aim:

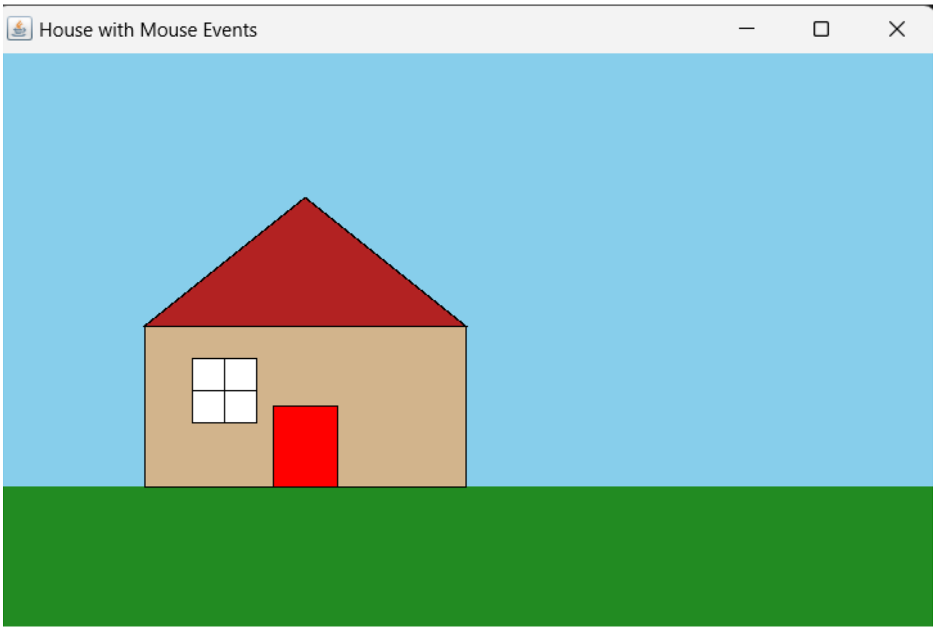
Draw a house using different Graphics class methods. On mouse click event, change the color of the door from blue to red.

Program

```
import java.awt.*;
import java.awt.event.*;
class MouseListenerExample extends Frame implements MouseListener
{
Color doorColor = Color.BLUE;
public MouseListenerExample()
{
setTitle("House with Mouse Events");
setSize(600, 400);
addMouseListener(this);
setVisible(true);
}
public void paint(Graphics g)
{
super.paint(g);
g.setColor(new Color(135, 206, 235));
g.fillRect(0, 0, getWidth(), getHeight());
g.setColor(new Color(34, 139, 34));
g.fillRect(0, 300, getWidth(), 100);
g.setColor(new Color(210, 180, 140));
g.fillRect(100, 200, 200, 100);
g.setColor(Color.BLACK);
g.drawRect(100, 200, 200, 100);
Polygon roof = new Polygon();
roof.addPoint(100, 200);
roof.addPoint(200, 120);
roof.addPoint(300, 200);
g.setColor(new Color(178, 34, 34));
g.fillPolygon(roof);
g.setColor(Color.BLACK);
g.drawPolygon(roof);
g.setColor(doorColor);
g.fillRect(180, 250, 40, 50);
g.setColor(Color.BLACK);
g.drawRect(180, 250, 40, 50);
g.setColor(Color.WHITE);
g.fillRect(130, 220, 40, 40);
g.setColor(Color.BLACK);
g.drawRect(130, 220, 40, 40);
g.drawLine(130, 240, 170, 240);
g.drawLine(150, 220, 150, 260);
}
public void mouseClicked(MouseEvent e)
if (doorColor == Color.BLUE)
{
doorColor = Color.RED;
}
else
{
doorColor = Color.BLUE;
}
repaint();
}
public void mouseEntered(MouseEvent e)
{}
public void mouseExited(MouseEvent e)
{}
public void mousePressed(MouseEvent e)
{}
public void mouseReleased(MouseEvent e)
{}
}
class HouseDoorColor
{
public static void main(String args[])
{
new MouseListenerExample();
}
}
```

Output



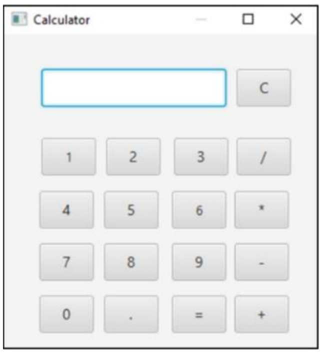


Experiment 28 Date:

Event Handling 4- Simple Calculator

Aim

Implement a simple calculator using different components and layout managers

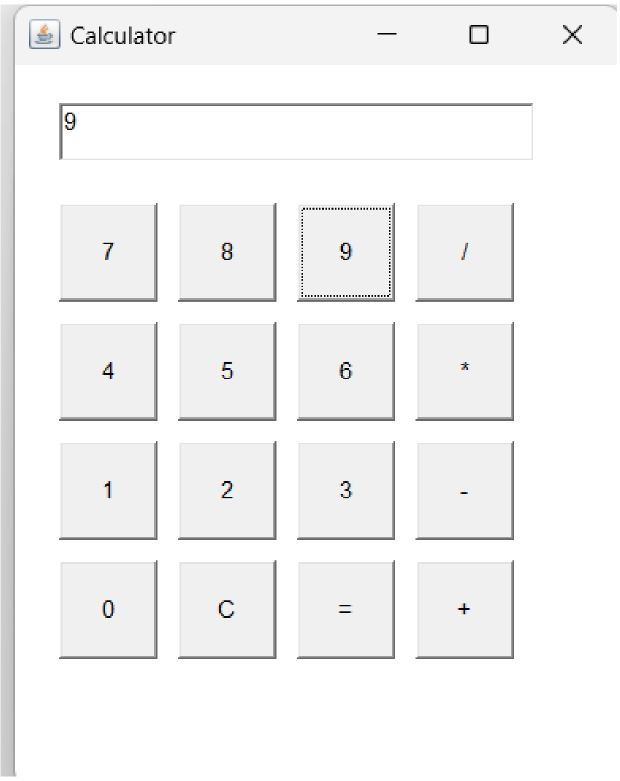


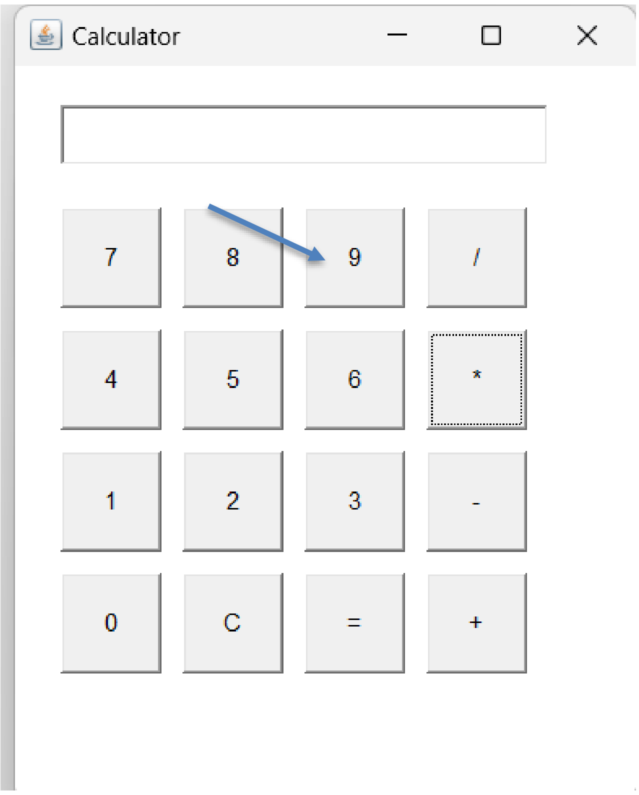
Program

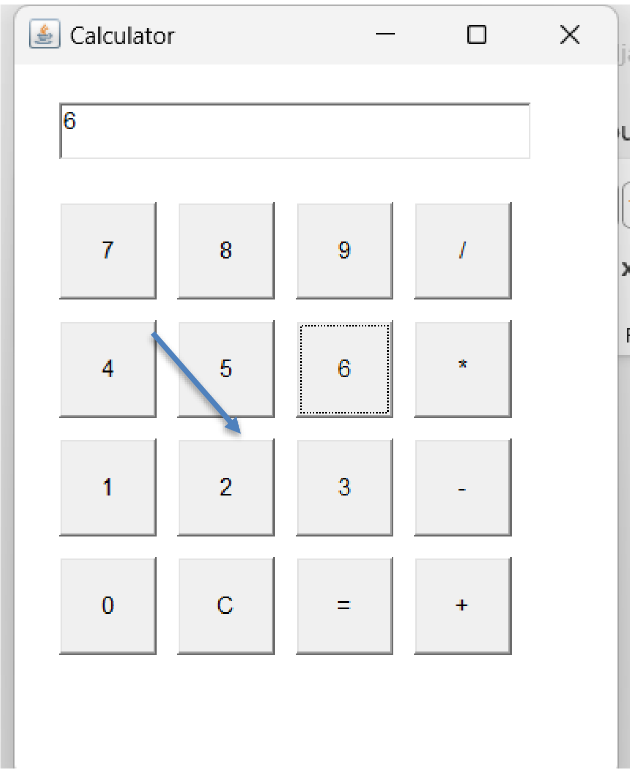
```
import java.awt.*;
import java.awt.event.*;
class SimpleCalculator extends Frame implements ActionListener
{
TextField tf;
double num1 = 0, num2 = 0, result = 0;
char operator;
SimpleCalculator()
{
setLayout(null);
tf = new TextField();
tf.setBounds(30, 50, 240, 30);
add(tf);
String[] labels = {
"7", "8", "9", "/",
"4", "5", "6", "*",
"1", "2", "3", "-",
"0", "C", "=", "+"
};
int x = 30, y = 100;
for (int i = 0; i < labels.length; i++)
{
Button b = new Button(labels[i]);
```

```
b.setBounds(x, y, 50, 50);
b.addActionListener(this);
add(b);
x += 60;
if ((i + 1) % 4 == 0)
{
x = 30;
y += 60;
}
}
setTitle("Calculator");
setSize(320, 400);
setVisible(true);
}
public void actionPerformed(ActionEvent e)
{
String cmd = e.getActionCommand();
if (cmd.charAt(0) >= '0' && cmd.charAt(0) <= '9' || cmd.equals("."))
{
tf.setText(tf.getText() + cmd);
}
else if (cmd.equals("C"))
{
tf.setText("");
num1 = num2 = result = 0;
}
else if (cmd.equals("="))
{
num2 = Double.parseDouble(tf.getText());
switch (operator)
{
case '+':
result = num1 + num2;
break;
case '-':
result = num1 - num2;
break;
case '*':
result = num1 * num2;
break;
case '/':
if (num2 == 0)
{
tf.setText("Error");
return;
}
result = num1 / num2;
break;
}
tf.setText("" + result);
}
else
{
num1 = Double.parseDouble(tf.getText());
operator = cmd.charAt(0);
tf.setText("");
}
}
}
class Calculator
{
public static void main(String args[])
{
new SimpleCalculator();
}
}
```

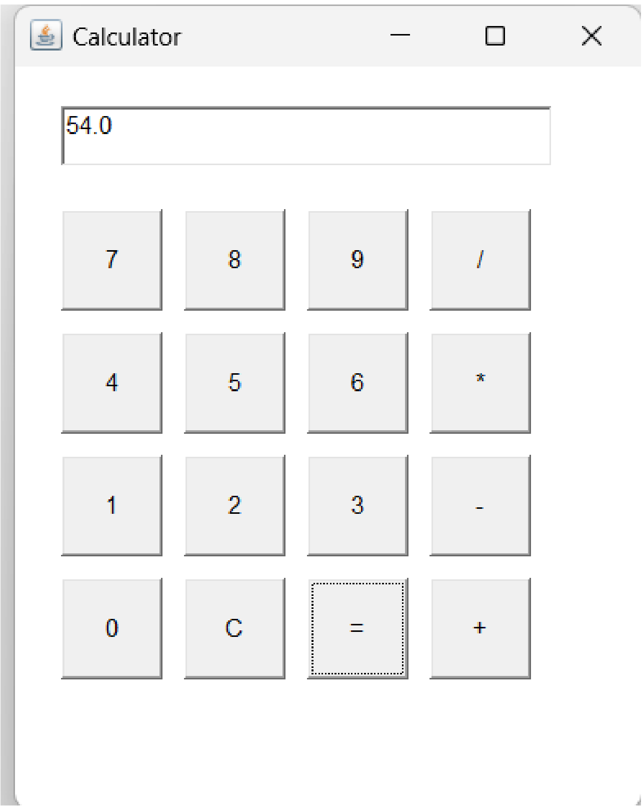
Output







Calculator
6
7
8
9
/
4
5
6
*
1
2
3
-
0
C
=
+



Calculator
54.0
7
8
9
/
4
5
6
*
1
2
3
-
0
C
=
+

Experiment 29 Date:

Event Handling 5- Drawing different shapes using choice component

Aim:

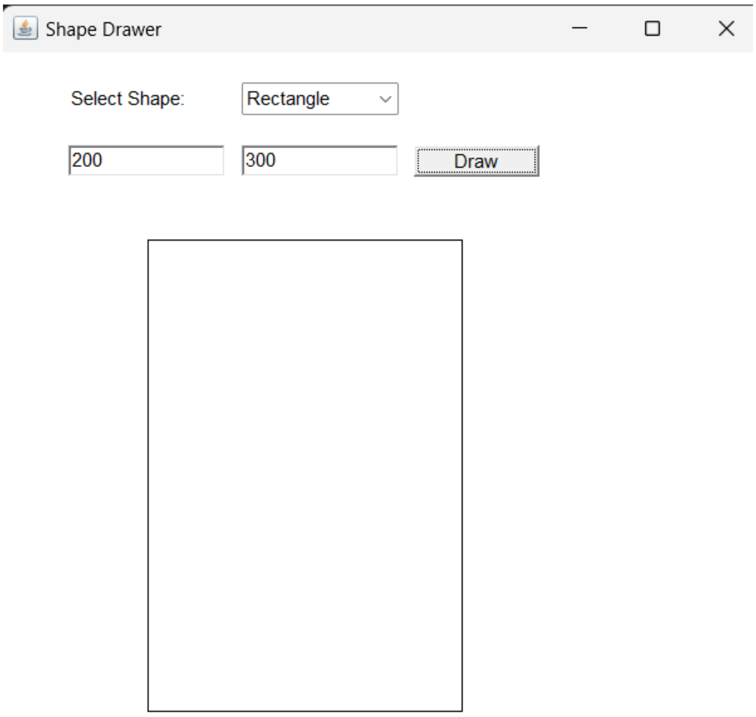
Develop a program that has a Choice component which contains the names of shapes such as rectangle, triangle, square and circle. Draw the corresponding shapes for given parameters as per user's choice.

Program

```
import java.awt.*;
import java.awt.event.*;
class ShapeDrawer extends Frame implements ActionListener, ItemListener
{
Choice shapeChoice;
TextField input1, input2;
Button drawButton;
String shape = "Rectangle";
int val1 = 0, val2 = 0;
public ShapeDrawer()
{
setTitle("Shape Drawer");
setSize(500, 500);
setLayout(null);
Label shapeLabel = new Label("Select Shape:");
shapeLabel.setBounds(50, 50, 100, 20);
add(shapeLabel);
shapeChoice = new Choice();
shapeChoice.add("Rectangle");
shapeChoice.add("Circle");
shapeChoice.add("Square");
shapeChoice.add("Triangle");
shapeChoice.setBounds(160, 50, 100, 20);
shapeChoice.addItemListener(this);
add(shapeChoice);
input1 = new TextField();
input1.setBounds(50, 90, 100, 20);
add(input1);
input2 = new TextField();
```

```
input2.setBounds(160, 90, 100, 20);
add(input2);
drawButton = new Button("Draw");
drawButton.setBounds(270, 90, 80, 20);
drawButton.addActionListener(this);
add(drawButton);
setVisible(true);
}
public void itemStateChanged(ItemEvent e)
{
shape = shapeChoice.getSelectedItem();
input1.setText("");
input2.setText("");
switch (shape) {
case "Rectangle":
case "Triangle":
input1.setEnabled(true);
input2.setEnabled(true);
break;
case "Square":
case "Circle":
input1.setEnabled(true);
input2.setEnabled(false);
break;
}
}
public void actionPerformed(ActionEvent e)
{
try
{
val1 = Integer.parseInt(input1.getText());
if (input2.isEnabled())
{
val2 = Integer.parseInt(input2.getText());
}
repaint();
}
catch (Exception ex)
{
System.out.println("Invalid input");
}
}
public void paint(Graphics g)
{
super.paint(g);
g.setColor(Color.black);
switch (shape)
{
case "Rectangle":
g.drawRect(100, 150, val1, val2);
break;
case "Circle":
g.drawOval(100, 150, val1, val1);
break;
case "Square":
g.drawRect(100, 150, val1, val1);
break;
case "Triangle":
int[] xPoints = {100, 100 + val1 / 2, 100 + val1};
int[] yPoints = {150 + val2, 150, 150 + val2};
g.drawPolygon(xPoints, yPoints, 3);
break;
}
}
}
class DrawShape
{
public static void main(String[] args)
{
new ShapeDrawer();
}
}
```

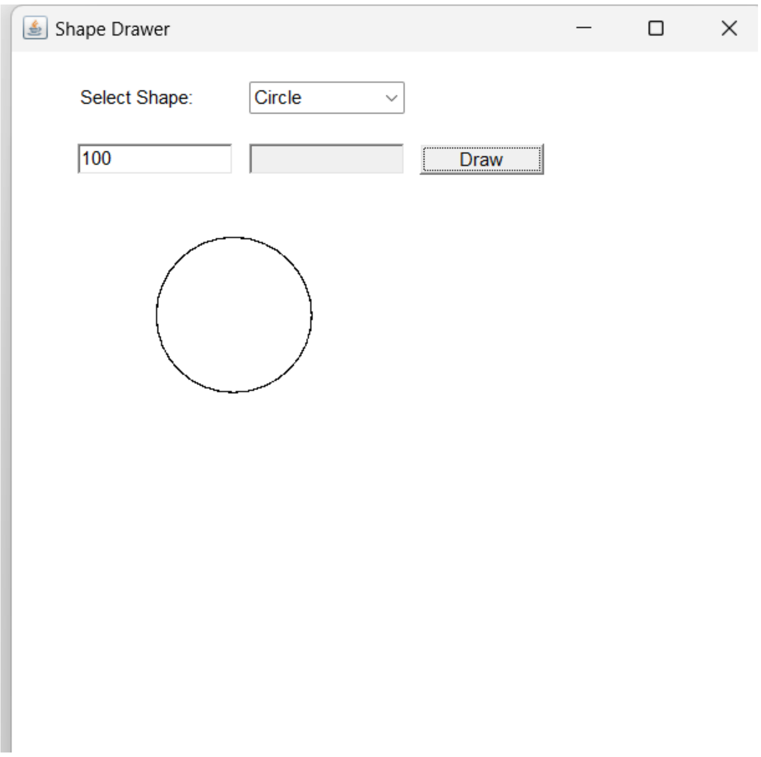
Output



Select Shape: Rectangle

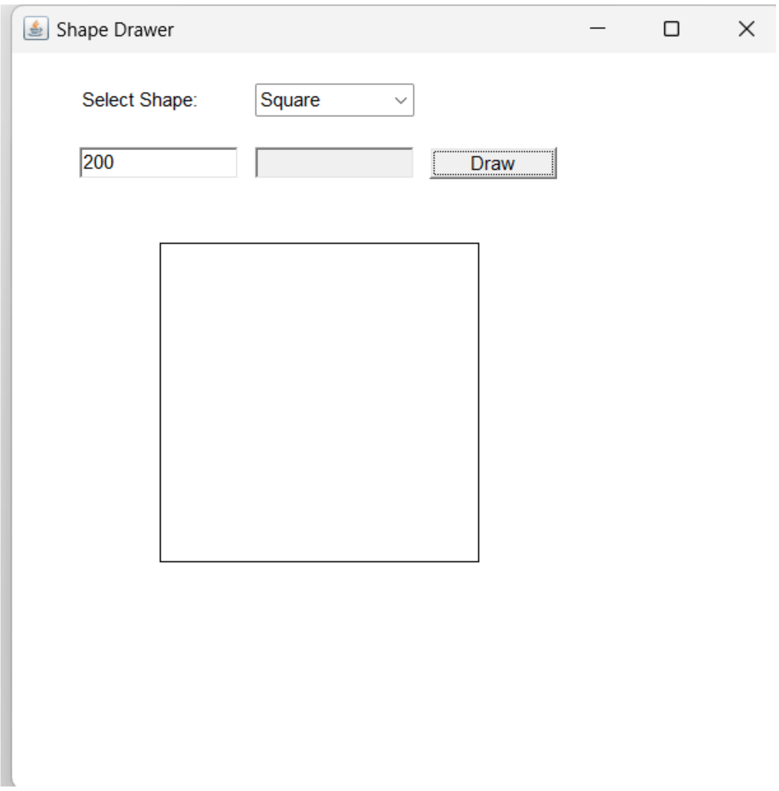
200

300



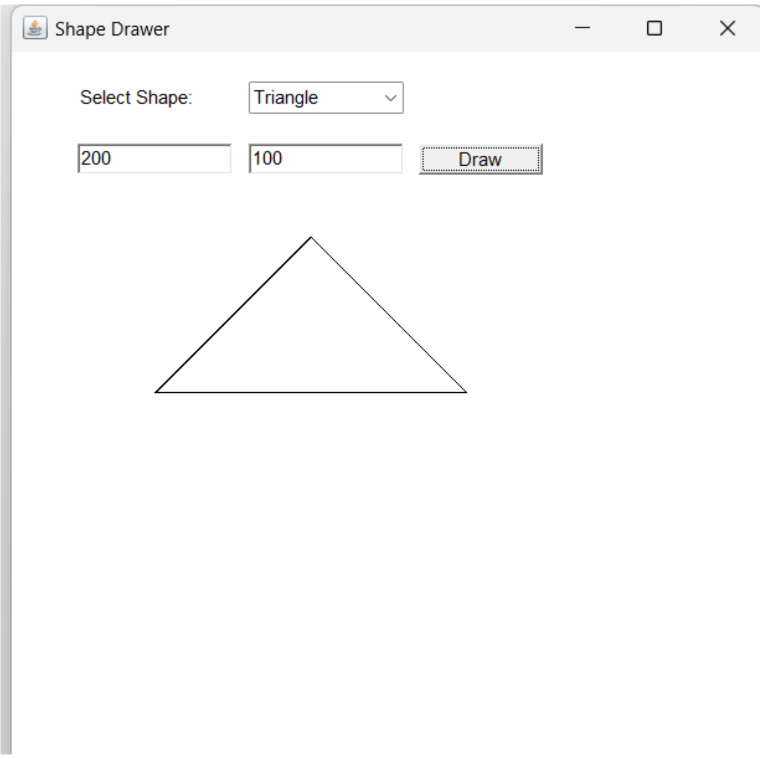
Select Shape: Circle

100



Select Shape: Square

200



Select Shape: Triangle

200

100

Experiment 30 Date:

Handling all Mouse events

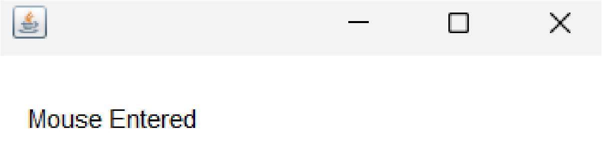
Aim:

Develop a program to handle all mouse events

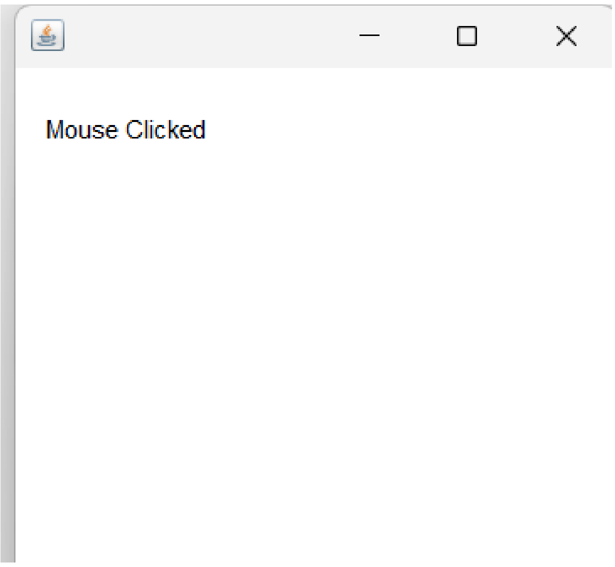
Program

```
//Handling different mouse events
import java.awt.*;
import java.awt.event.*;
class MouseListenerExample extends Frame implements MouseListener
{
Label l;
MouseListenerExample()
{
addMouseListener(this);
l=new Label();
l.setBounds(20,50,100,20);
add(l);
setSize(300,300);
setLayout(null);setVisible(true);
}
public void mouseClicked(MouseEvent e)
{
l.setText("Mouse Clicked");
}
public void mouseEntered(MouseEvent e)
{
l.setText("Mouse Entered");
}
public void mouseExited(MouseEvent e)
{
l.setText("Mouse Exited");
}
public void mousePressed(MouseEvent e)
{
l.setText("Mouse Pressed");
}
public void mouseReleased(MouseEvent e)
{
l.setText("Mouse Released");
}
}
class MouseEvents
{
public static void main(String[] args)
{
new MouseListenerExample();
}
}
```

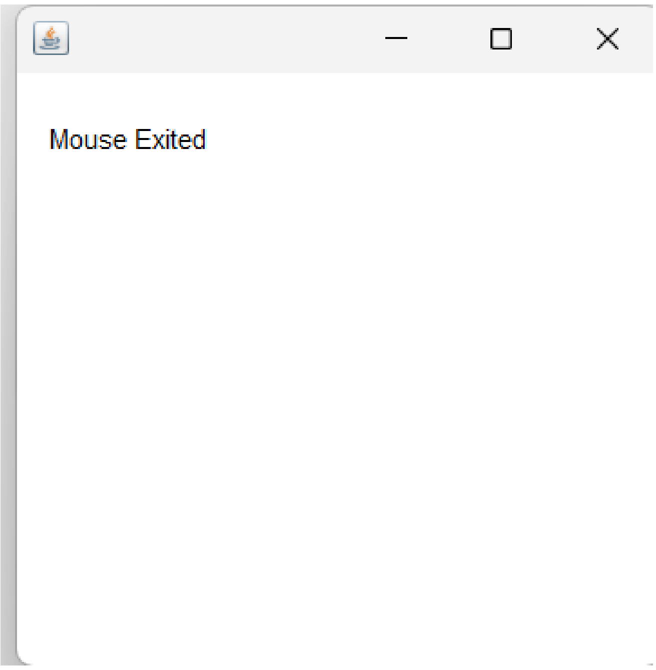
Output



Mouse Entered



Mouse Clicked



```
Mouse Exited
```

Experiment 31 Date:

Handling all Window Events

Aim:

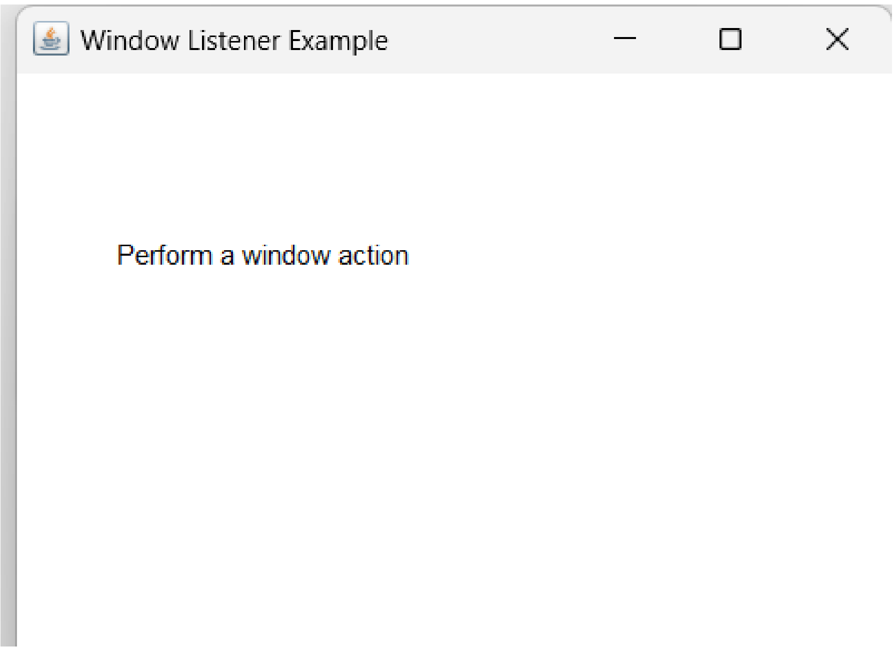
Develop a program to handle all window events

Program

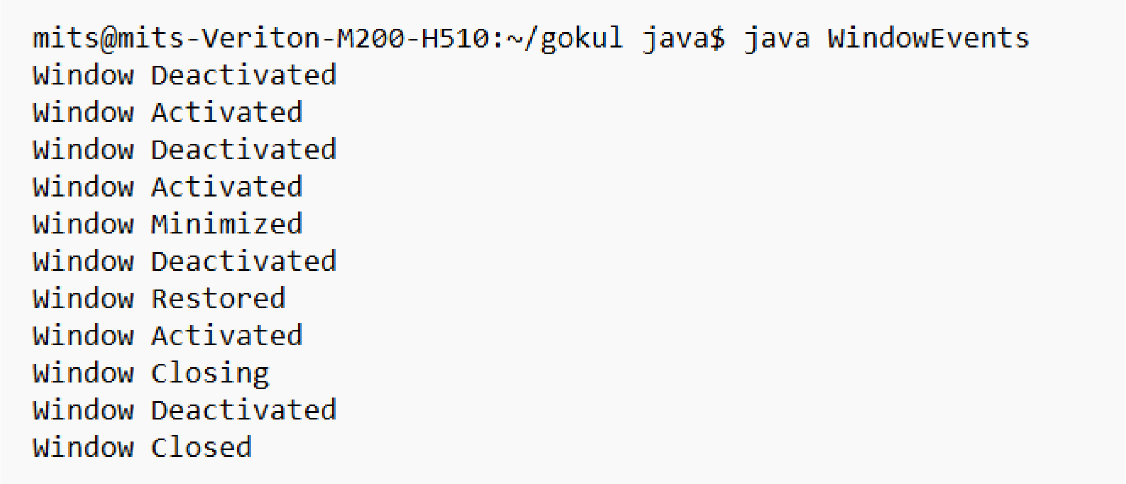
```
import java.awt.*;
import java.awt.event.*;
class WindowListenerExample extends Frame implements WindowListener
{
Label l;
WindowListenerExample()
{
setTitle("Window Listener Example");
l = new Label("Perform a window action");
l.setBounds(50, 100, 300, 20);
add(l);
setSize(400, 300);
setLayout(null);
setVisible(true);
addWindowListener(this);
}
public void windowOpened(WindowEvent e)
{
System.out.println("Window Opened");
}
public void windowClosing(WindowEvent e)
{
System.out.println("Window Closing");
dispose();
}
public void windowClosed(WindowEvent e)
{
System.out.println("Window Closed");
}
public void windowIconified(WindowEvent e)
{
```

```
System.out.println("Window Minimized");
}
public void windowDeiconified(WindowEvent e)
{
System.out.println("Window Restored");
}
public void windowActivated(WindowEvent e)
{
System.out.println("Window Activated");
}
public void windowDeactivated(WindowEvent e)
{
System.out.println("Window Deactivated");
}
}
class WindowEvents
{
public static void main(String args[])
{
new WindowListenerExample();
}
}
```

Output



Perform a window action



```
mits@mits-Veriton-M200-H510:~/gokul java$ java WindowEvents
Window Deactivated
Window Activated
Window Deactivated
Window Activated
Window Minimized
Window Deactivated
Window Restored
Window Activated
Window Closing
Window Deactivated
Window Closed
```

Experiment 32 Date:

Handling Key Events

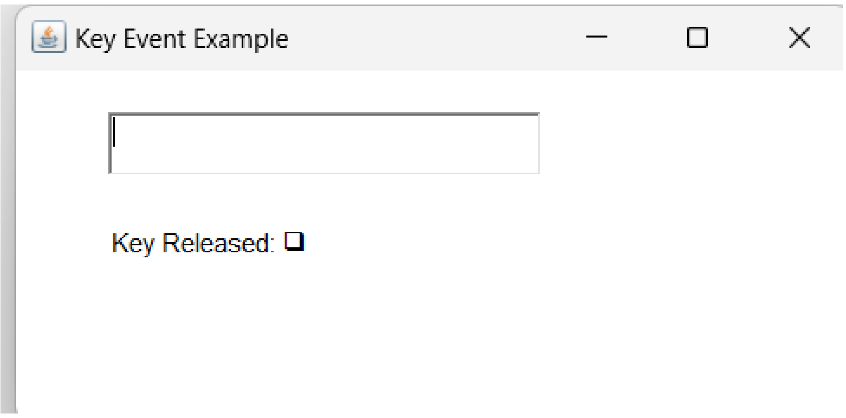
Aim:

Develop a program to handle Key events.

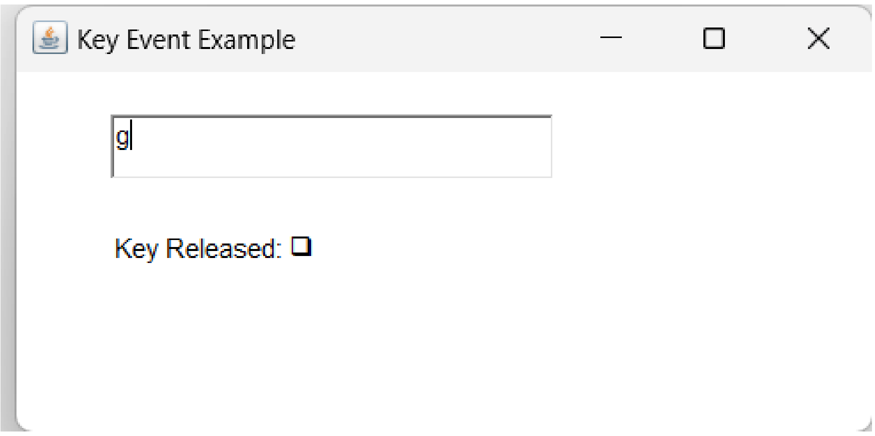
Program

```
import java.awt.*;
import java.awt.event.*;
class KeyEventExample extends Frame implements KeyListener
{
Label l;
TextField tf;
KeyEventExample()
{
setTitle("Key Event Example");
l = new Label("Press any key...");
l.setBounds(50, 100, 300, 20);
tf = new TextField();
tf.setBounds(50, 50, 200, 30);
tf.addKeyListener(this);
add(tf);
add(l);
setSize(400, 200);
setLayout(null);
setVisible(true);
}
public void keyTyped(KeyEvent e)
{
l.setText("Key Typed: " + e.getKeyChar());
}
public void keyPressed(KeyEvent e)
{
l.setText("Key Pressed: " + e.getKeyChar());
}
public void keyReleased(KeyEvent e)
{
l.setText("Key Released: " + e.getKeyChar());
}
}
class KeyEvents
{
public static void main(String args[])
{
new KeyEventExample();
}
}
```

Output



Key Released: ❑



g

Key Released: ❑

Course Outcome 4

Experiment 33 Date:

File Handling 1- List the elements in the directory and search for a file

Aim:

Program to list the sub directories and files in a given directory and also search for a file name.

Program

```
import java.io.File;
import java.util.*;
class FileSearch
{
public static void main(String args[])
{
try
{
Scanner obj = new Scanner(System.in);
System.out.println("Enter the directory path:");
String dirPath = obj.nextLine();
File f = new File(dirPath);
if (!f.exists() || !f.isDirectory())
{
System.out.println("Invalid directory path!");
return;
}
File[] list = f.listFiles();
System.out.println("Contents of the directory:");
for (int i = 0; i < list.length; i++)
{
if (list[i].isDirectory())
{
System.out.println("[DIR]  " + list[i].getName());
}
else
{
System.out.println("[FILE] " + list[i].getName());
}
}
System.out.println("Enter file name to search:");
String searchName = obj.nextLine();
boolean found = false;
for (int i = 0; i < list.length; i++)
{
if (list[i].getName().equalsIgnoreCase(searchName))
{
System.out.println("File found at: " + list[i].getAbsolutePath());
found = true;
break;
}
}
if (!found)
{
System.out.println("File not found in the directory.");
}
}
catch (Exception e)
{
System.out.println(e);
}
}
}
```

Output

```
PS D:\gokul java\Set 27> java FileSearch
Enter the directory path:
D:\website
Contents of the directory:
[DIR]  .git
[DIR]  assets
[DIR]  forms
[FILE] index.html
Enter file name to search:
index.HTML
File found at: D:\website\index.html
```

Experiment 34 Date:

File Handling 2- Perform read and write operation in a file

Aim:

Develop program to write employee details to a file, then read from that file and display the contents on the console.

Program

```
import java.io.*;
import java.util.*;
class File
{
public static void main(String args[])
{
try
{
Scanner obj = new Scanner(System.in);
FileOutputStream fout = new FileOutputStream("employee2.txt");
int empno;
String empname;
int salary;
System.out.println("Enter the no of employees:");
int limit=obj.nextInt();
for(int j=0;j<limit;j++)
{
System.out.println("Enter the employee number:");
empno=obj.nextInt();
String a = String.valueOf(empno);
byte a1[]=a.getBytes();
fout.write(a1);
fout.flush();
fout.write("\r\n".getBytes());
obj.nextLine();
System.out.println("Enter the employee name:");
empname=obj.nextLine();
byte b[]=empname.getBytes();
fout.write(b);
fout.flush();
fout.write("\r\n".getBytes());
System.out.println("Enter the employee salary:");
salary=obj.nextInt();
String c = String.valueOf(salary);
byte c1[]=c.getBytes();
fout.write(c1);
fout.flush();
fout.write("\r\n".getBytes());
}
fout.close();
}
catch(Exception e)
{
 System.out.println(e);
}
try
{
FileInputStream fin = new FileInputStream("employee2.txt");
System.out.println("Total size is:" + fin.available());
int n =fin.available();
for(int i=0;i<n;i++)
{
System.out.print((char)fin.read());
}
fin.close();
}
catch(Exception e)
{
System.out.print(e);
}
}
}
```

Output

```
PS D:\gokul java\Set 27> java File
Enter the no of employees:
2
Enter the employee number:
101
```

```
Enter the employee name:
gokul
Enter the employee salary:
45000
Enter the employee number:
102
Enter the employee name:
abhijith
Enter the employee salary:
50000
Total size is:41
101
gokul
45000
102
abhijith
50000
```

Experiment 35 Date:

File Handling 3- Copy contents from one file to other

Aim:

Write a program to copy one file to another.

Program

```
import java.io.*;
import java.util.*;
class CopyFile
{
public static void main(String args[]) throws Exception
{
Scanner sc = new Scanner(System.in);
System.out.print("Provide source file name :");
String sfile = sc.next();
System.out.print("Provide destination file name :");
String dfile = sc.next();
FileReader fin = new FileReader(sfile);
FileWriter fout = new FileWriter(dfile, true);
int c;
while ((c = fin.read()) != -1)
{
fout.write(c);
}
System.out.println("Copy finish...");
fin.close();
fout.close();
}
}
```

Output

```
PS D:\gokul java\Set 27> java CopyFile
Provide source file name :set27answer.txt
Provide destination file name :file1.txt
Copy finish...
```

Experiment 36 Date:

File Handling 4- Create two separate files

Aim

Write a program that reads from a file having integers. Copy even numbers and odd numbers to separate files.

Program

```
import java.io.*;
import java.util.*;
class EvenOddSeparator {
public static void main(String args[])
{
try {
Scanner input = new Scanner(new java.io.File("numbers.txt"));
FileOutputStream evenOut = new FileOutputStream("even.txt");
FileOutputStream oddOut = new FileOutputStream("odd.txt");
while (input.hasNextInt())
{
int num = input.nextInt();
String data = num + "\r\n";
if (num % 2 == 0)
{
evenOut.write(data.getBytes());
evenOut.flush();
}
else {
oddOut.write(data.getBytes());
oddOut.flush();
}
}
input.close();
evenOut.close();
oddOut.close();System.out.println("Even and odd numbers have been separated into
'even.txt' and 'odd.txt'.");
}
catch (Exception e)
{
```

```
System.out.println(e);
}
try {
System.out.println("\nContents of even.txt:");
FileInputStream finEven = new FileInputStream("even.txt");
int ch;
while ((ch = finEven.read()) != -1)
{
System.out.print((char) ch);
}
finEven.close();
System.out.println("\nContents of odd.txt:");
FileInputStream finOdd = new FileInputStream("odd.txt");
while ((ch = finOdd.read()) != -1)
{
System.out.print((char) ch);
}
finOdd.close();
}
catch (Exception e){
System.out.println(e);
}
}
}
```

Output

```
PS D:\gokul java\Set 27> java EvenOddSeparator
Even and odd numbers have been separated into 'even.txt' and 'odd.txt'.
Contents of even.txt:
12
8
20
2
6
Contents of odd.txt:
7
5
33
9
```

Experiment 37 Date:

Create Generic Stack

Aim:

Program to create a generic stack and do the Push and Pop operations.

Program

```
import java.util.*;
import java.io.*;
public class StackDemo
{
public static void main(String args[])
{
Stack<Integer> stk = new Stack<Integer>();
stk.push(10);
stk.push(15);
stk.push(30);
stk.push(20);
stk.push(5);
System.out.println("Initial Stack: " + stk);
System.out.println("The element at the top of the stack is: " + stk.peek());
System.out.println("The element at the top of the stack is: " + stk.peek());
}
}
```

Output

```
PS D:\gokul java\Set 27> java StackDemo
Initial Stack: [10, 15, 30, 20, 5]
The element at the top of the stack is: 5
The element at the top of the stack is: 5
```

Experiment 38 Date:

Generic Method for Perform Bubblesort

Aim:

Using generic method to perform Bubble sort.

Program

```
public class GenericBubbleSort
{
public static <T extends Number & Comparable<T>> void bubbleSort(T[] array)
{
int n = array.length;
T temp;
for (int i = 0; i < n - 1; i++)
{
for (int j = 0; j < n - 1 - i; j++)
{
if (array[j].compareTo(array[j + 1]) > 0)
{
temp = array[j];
array[j] = array[j + 1];
array[j + 1] = temp;
}
}
}
}
public static <T> void printArray(T[] array)
{
for (T num : array)
{
System.out.print(num + " ");
}
System.out.println();
}
public static void main(String[] args)
{
Integer[] intArr = {5, 2, 9, 1, 3};
System.out.println("Before sorting:");
printArray(intArr);
bubbleSort(intArr);
System.out.println("After sorting:");
printArray(intArr);
}
}
```

Output

```
PS D:\gokul java\Set 27> java GenericBubbleSort
Before sorting:
5 2 9 1 3
After sorting:
1 2 3 5 9
```

Experiment 39 Date:

Generic ArrayList

Aim:

Maintain a list of Strings using ArrayList from collection framework, perform built-in operations.

Program

```
import java.util.ArrayList;
class ExampleArray
{
public static void main(String[] args)
{
ArrayList<String> languages = new ArrayList<>();
languages.add("C");
languages.add("Python");
System.out.println("ArrayList: " + languages);
String str = languages.get(1);
System.out.println("Element at index 1: " + str);
languages.set(1, "Java");
System.out.println("Modified ArrayList: " + languages);
String removed = languages.remove(1);
System.out.println("Updated ArrayList: " + languages);
System.out.println("Removed Element: " + removed);
}
}
```

Output

```
PS D:\gokul java\Set 27> java ExampleArray
ArrayList: [C, Python]
Element at index 1: Python
Modified ArrayList: [C, Java]
Updated ArrayList: [C]
Removed Element: Java
```

Experiment 40 Date:

Generic Linked List

Aim:

Program to remove all the elements from a linked list

Program

```
import java.util.*;
public class DemoLinkedlist
{
public static void main(String args[])
{
LinkedList<String> l_list = new LinkedList<String>();
l_list.add("Green"); l_list.add("Black");
l_list.add("Pink"); l_list.add("orange");
System.out.println("The Original linked list: " + l_list);
System.out.println("The New linked list: " + l_list);
}
}
```

Output

```
PS D:\gokul java\Set 27> java DemoLinkedlist
The Original linked list: [Green, Black, Pink, orange]
The New linked list: [Green, Black, Pink, orange]
```

Experiment 41 Date:

Generic Stack for Remove an Object

Aim:

Program to remove an object from the Stack when the position is passed as parameter

Program

```
import java.util.*;
public class StackRemoveByPosition
{
public static <T> void removeAtPosition(Stack<T> stk, int position)
{
if (position < 0 || position >= stk.size())
{
System.out.println("Invalid position.");
return;
}
Stack<T> temp = new Stack<>();
for (int i = 0; i < position; i++)
{
temp.push(stk.pop());
}
T removedElement = stk.pop();
System.out.println("Removed element: " + removedElement);
while (!temp.isEmpty())
{
stk.push(temp.pop());
}
}
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
Stack<Integer> stk = new Stack<>();
stk.push(10);
stk.push(15);
stk.push(30);
stk.push(20);
stk.push(5);
System.out.println("Initial Stack: " + stk);
System.out.println("The element at top of stack: " + stk.peek());
System.out.print("Enter the position (0 = top) of element to remove: ");
int position = sc.nextInt();
removeAtPosition(stk, position);
System.out.println("Stack after removal: " + stk);
if (!stk.isEmpty())
{
System.out.println("The element at the top of the stack is: " + stk.peek());
}
else
{
System.out.println("Stack is empty now.");
}
sc.close();
}
}
```

Output

```
PS D:\gokul java\Set 27> java StackRemoveByPosition
Initial Stack: [10, 15, 30, 20, 5]
The element at top of stack: 5
Enter the position (0 = top) of element to remove: 2
Removed element: 30
Stack after removal: [10, 15, 20, 5]
The element at the top of the stack is: 5
```

Experiment 42 Date:

Multithreding 1- using Thread Class

Aim:

Define 2 classes; one for generating multiplication table of 5 and other for displaying first N prime numbers. Implement using threads. (Thread class)

Program

```
class TableThread extends Thread  {
public void run()  {
System.out.println("Multiplication Table of 5:");
for (int i = 1; i <= 10; i++)
{
System.out.println("5 x " + i + " = " + (5 * i));
}
}
}
class PrimeThread extends Thread  {
int n;
PrimeThread(int n)
{
this.n = n;
}
public void run()
{
System.out.println("\nFirst " + n + " Prime Numbers:");
int count = 0, num = 2;
while (count < n)
{
if (isPrime(num))
{
System.out.print(num + " ");
count++;
}
num++;
}
System.out.println();
}
boolean isPrime(int x)
{
if (x <= 1)
return false;
for (int i = 2; i <= Math.sqrt(x); i++)
{
if (x % i == 0)
return false;
}
return true;
}
}
public class ThreadExample
{
public static void main(String args[])
{
TableThread t1 = new TableThread();
PrimeThread t2 = new PrimeThread(10);
t1.start();
t2.start();
}
}
```

Output

```
PS D:\gokul java\Set 27> java ThreadExample
Multiplication Table of 5:

First 10 Prime Numbers:
2 3 5 7 11 13 5 x 1 = 5
17 19 5 x 2 = 10
23 5 x 3 = 15
5 x 4 = 20
29
5 x 5 = 25
5 x 6 = 30
5 x 7 = 35
5 x 8 = 40
5 x 9 = 45
5 x 10 = 50
```

Experiment 43 Date:

Multithreding 2- using Runnable interface

Aim:

Define 2 classes; one for generating Fibonacci numbers and other for displaying even numbers in a given range. Implement using threads. (Runnable Interface)

Program

```
class FibonacciGenerator implements Runnable
{
private int count;
public FibonacciGenerator(int count)
{
this.count = count;
}
public void run()
{
System.out.println("Fibonacci Series (" + count + " terms):");
int a = 0, b = 1;
System.out.print(a + " " + b + " ");
for (int i = 2; i < count; i++)
{
int c = a + b;
System.out.print(c + " ");
a = b;
b = c;
}
System.out.println();
}
}
class EvenNumberPrinter implements Runnable
{
private int start, end;
public EvenNumberPrinter(int start, int end)
{
this.start = start;
this.end = end;
}
public void run()
{
System.out.println("Even Numbers from " + start + " to " + end + ":");
for (int i = start; i <= end; i++)
{
if (i % 2 == 0)
{
System.out.print(i + " ");
}
}
System.out.println();
}
}
public class RunnableExample
{
public static void main(String args[])
{
Runnable fibTask = new FibonacciGenerator(10);
Runnable evenTask = new EvenNumberPrinter(1, 20);
Thread t1 = new Thread(fibTask);
Thread t2 = new Thread(evenTask);
t1.start();
t2.start();
}
}
```

Output

```
PS D:\gokul java\Set 27> java RunnableExample
Fibonacci Series (10 terms):
0 1 Even Numbers from 1 to 20:
1 2 3 5 2 8 4 6 8 10 12 14 16 18 20 13 21
34
```